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## MACKENZIE VALLEY PIPELINE INQUIRY

IN THE MATTER OF AN APPLICATION BY CANADIAN ARCTIC  
GAS PIPELINE LIMITED FOR A RIGHT-OF-WAY THAT MIGHT  
BE GRANTED ACROSS CROWN LANDS WITHIN THE YUKON  
TERRITORY AND THE NORTHWEST TERRITORIES FOR THE  
PURPOSE OF THE PROPOSED MACKENZIE VALLEY PIPELINE

and

IN THE MATTER OF THE SOCIAL, ENVIRONMENTAL AND  
ECONOMIC IMPACT REGIONALLY OF THE CONSTRUCTION,  
OPERATION AND SUBSEQUENT ABANDONMENT OF THE ABOVE  
PROPOSED PIPELINE

(Before the Honourable Mr. Justice Berger, Commissioner)

Yellowknife, N.W.T.

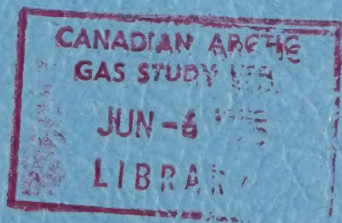
May 24, 1975.

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## PROCEEDINGS AT INQUIRY

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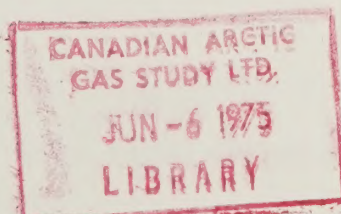




APPEARANCES:

Mr. Ian G. Scott, Q.C.	
Mr. Stephen T. Goudge,	
Mr. Alick Ryder and	
Mr. Ian Roland	for Mackenzie Valley Pipeline Inquiry;
Mr. Pierre Genest, Q.C.	
Mr. Jack Marshall,	
Mr. Darryl Carter, and	
Mr. John Steeves	for Canadian Arctic Gas Pipeline Limited;
Mr. Reginald Gibbs, Q.C.	
Mr. Alan Hollingworth	for Foothills Pipelines Ltd.;
Mr. Russell Anthony,	
Prof. Alastair Lucas	for Canadian Arctic Resources Committee;
Mr. Glen W. Bell and	
Mr. Gerry Sutton	for Northwest Territories Indian Brotherhood and Metis Association of the Northwest Territories;
Mr. John U. Bayly	for Inuit Tapirisat of Canada and the Committee for Original Peoples' Entitlement;
Mr. Ron Veale and	
Mr. Allen Lueck	for Yukon Native Brotherhood;
Mr. Carson H. Templeton	for Environment Protection Board;
Mr. David Reesor	for Northwest Territories Association of Municipalities
Mr. Murray Sigler	for Northwest Territories Chamber of Commerce

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WITNESSES FOR APPLICANT:

Vernon L. HORTE

- Cross-Examination by Mr. Bayly (cont) 5883
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EXHIBIT:

134 Horte Resume 5887





1 Yellowknife, N.W.T.

2 May 24, 1975.

3 (PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

4 MR. GENEST: Mr. Commissioner,  
5 before Mr. Bayly resumes his cross-examination I want  
6 to deal with a matter you raised yesterday, sir, in  
7 connection with the situation relating to <sup>the</sup> / land use  
8 application for purposes of a survey near Fort Good  
9 Hope, which was raised by Mr. Bell. The question in  
10 particular was as to whether an environmental inspector  
11 would accompany the survey crew.

12 We have checked with the N.E.S.  
13 people and looked into the matter, sir, and I am  
14 advised as follows: First, as stated in the land  
15 use application, the survey is a limited test survey,  
16 the purpose of which is to verify the accuracy of the  
17 ortho photo-mosaic method of surveying for route  
18 location. I am also advised, sir, that the environ-  
19 mental staff of N.E.S. is familiar with the area and  
20 that it is intended that this staff will give an en-  
21 vironmental briefing to the surveyors prior to their  
22 going to the site.

23 I am also advised that when  
24 the survey crew is conducting the test survey, their  
25 work will be inspected at least twice by N.E.S.  
26 environmental people to ensure that the survey work  
27 is being conducted in accordance with good environmen-  
28 tal practice.

29 The policy, sir, referred to  
30 in Section 13-A-6, page 27, which was read by Mr. Bell,





1 applies mainly to the location survey phase of the  
2 pipeline and is intended to ensure that the route  
3 staked out on the ground by the surveyors does not  
4 create unanticipated environmental or archeological  
5 problems, and to allow for minor changes to avoid these  
6 problems; and if N.E.S. felt that because a particular  
7 survey referred to in the land use application is not  
8 for the purpose of staking out the pipeline location,  
9 but is for the purpose of testing a survey method,  
10 N.E.S. did not feel it necessary to have an environ-  
11 mental inspector at the test site at all times.

12 As far as consultation, sir,  
13 with the people of Fort Good Hope, it was N.E.S.'s  
14 view that the land use regulations -- and I think it  
15 is evidenced by the correspondence from the govern-  
16 ment official concerned, that that was a function of  
17 that official that the reaction of the community was  
18 obtained in that way. That is what happened.

19 THE COMMISSIONER: Thank you  
20 very much.

21 MR. GENEST: Perhaps I could  
22 add that Mr. -- we ended yesterday on a note of argument  
23 between Mr. Scott and I. I think we have resolved it  
24 and it will come out in the course of his cross-examina-  
25 tion. At least I hope we have.

26 MR. BAYLY: Mr. Commissioner, we  
27 left off yesterday at a point where we were discussing  
28 a question relating to an area near Arctic Red River,  
29 which I had called the Peel Plateau, and which on  
30 speaking to Mr. Williams, appeared to have been





V.L. Horte  
Cross-Exam by Bayly

1 either the Peel Plain or an area to the south of the  
2 Mackenzie River. It runs west at that point, up to  
3 the east of Arctic Red River, which is neither called  
4 the Peel Plateau nor the Peel Plain.

5  
6 VERNON L. HORTE, resumed:

7 CROSS-EXAMINATION BY MR. BAYLY (CONTINUED):

8 Q I think I can clear this  
9 up, sir, by referring Mr. Horte to the transcript,  
10 Volume 17, page 1952, and this was during my cross-  
11 examination of the Dau panel, and Mr. Williams was  
12 responding to a question, and I better go back one page,  
13 sir, and read the question, put it into context. On  
14 page 1951 at line 27:

15 "Q The difficulty I am having, Mr. Dau, is  
16 suddenly we have a statement that the  
17 pipeline must be an appropriate distance  
18 from settlements and we do not know where  
19 that came from. Perhaps Mr. Williams has  
20 some idea where that came from."

21 And an answer from Mr. Williams:

22 "I think we should go back to the April --  
23 was it April, '73, seminar. Prior to that  
24 time all consultants, biological and socio-  
25 economic consultants had copies of the  
26 proposed route. They had these for studies  
27 -- for study for several months prior to  
28 the meeting and during the meeting some of  
29 these questions were discussed, and I do  
30 not recall ever hearing any firm recommendation





V.L. Horte  
Cross-Exam by Bayly

1 that the route be altered because of  
2 proximity to communities or urban cen-  
3 tres, or what have you. There was no  
4 firm recommendation that came forward at  
5 that meeting. Now there is the one that  
6 I mentioned previously <sup>with respect</sup> to the traditional  
7 trapping area west -- I'm sorry, east of  
8 Arctic Red River. It was suggested by  
9 the socio-economic consultants that it  
10 would be nice if the route could be  
11 altered there. There was discussion at  
12 some length, and it was agreed that the  
13 extra mileage that would be added was  
14 prohibitive from an engineering aspect  
15 and it was agreed that we would, except  
16 for making a major change at Travaillant  
17 Lake junction, that that lag from Arctic  
18 Red to the new Travaillant Lake junction  
19 would go in more or less a direct route  
20 which does cross this traditional hunting  
21 area."





1 And with reference to  
2 this , Mr. Horte, were you aware that this discussion  
3 was taking place and were Arctic Gas staff people or  
4 consultants in a socio-economic discipline involved  
5 in these ?

6 A Yes, they were. These  
7 meetings were set up specifically by Arctic Gas in  
8 Calgary and took place over two or three days.  
9 I attended portions of the meetings, not all of the  
10 meetings, with the prime purpose of then reviewing  
11 with all the various disciplines the routing that  
12 had to that point been selected to get all the  
13 inputs, final inputs from these various areas of  
14 expertise to see what changes, if any, were  
15 required as a result of these overall discussions.

16 Q And in your involvement  
17 in the meetings or the involvement of others  
18 that was reported to you, was there some basic  
19 guidelines or criteria set up for deciding when a  
20 consideration like crossing an important trapping  
21 area had to be made in your estimation because it  
22 was outweighed by the economic factors?

23 A I don't think any  
24 specific yardstick sir, it was simply a matter of  
25 sitting down and looking at all those factors and  
26 see where give and take could be obtained to come  
27 up with what, from the standpoint of the -- of all  
28 of the aspects, appeared to be the best situation.  
29 Obviously, involving compromises in many areas.

30 Q Well then perhaps we





V.L. Horte  
Cross-Exam by Bayly

1 could go to the one that appeared at least in the  
2 first instance to have gone the other way and  
3 that is the discussion that takes place in the  
4 application 8-A 1, at page 6 -- this is exhibit  
5 54.

6 Have you a copy of that,  
7 sir ?

8 A Yes, I do. 8-A 1?

9 Q 8-A 1, at page 6

10  
11 A Yes.

12 Q And without reading  
13 the entire thing, I understand that the basis of  
14 this was that the prime route was moved about 20  
15 miles west of its original routing because it --  
16 the desire of Arctic Gas was to avoid the Travaillant  
17 Lakes which were seen as a highly productive area  
18 for mammals and fish and birds.

19 A Yes, there was a  
20 change made in that area.

21 Q And have you before you,  
22 sir, the map that was given to all of us when the  
23 cross-delta alternative was first proposed?

24 A I have a map here that  
25 shows the cross-delta, yes.

26 Q Perhaps your counsel  
27 could assist me. I just wasn't able to find what  
28 exhibit<sup>number</sup> this was, if it were introduced as an  
29 exhibit.

30 MR. GENEST: I think it was





1 -- I will have to check the list.

2 A I have a map which  
3 is entitled Figure D-11, "Alternative Routing  
4 Mackenzie Delta Area"

5 MR. BAYLY: That is the  
6 one that I am referring to. Mr. Commissioner, do  
7 you have that before you?

8 THE COMMISSIONER: I have  
9 it.

10 MR. GENEST: Mr. Carter tells  
11 me he doesn't know if that was filed as an exhibit.  
12 It was handed around, I don't know if we ever  
13 marked it. Well, perhaps we can find out. If it hasn't  
14 we will give it a number.

15 MR. BAYLY: Would there  
16 be any objection to it -- all right.

17 THE COMMISSIONER: Was  
18 it marked?

19

20

21 MR. BAYLY: Perhaps it  
22 could receive a number then, sir.

23 THE COMMISSIONER: I think  
24 it should be marked then.

25 MR. GENEST: Right, sir.

26 (MAP ENTITLED D-11, "ALTERNATIVE ROUTINGS MACKENZIE DELTA  
27 AREA" MARKED AS EXHIBIT I34)

28 MR. BAYLY:

29 Q Now, Mr. Horte, on  
30 this map there are two lines. There is the prime





V.L. Horte  
Cross-Exam by Bayly

1 route which is marked with a dotted line --

2 A Yes.

3 Q And the proposed alternative,  
4 Shallow Bay crossing and cross-delta route which is  
5 marked with a solid line.

6 A Yes, sir.

7 Q Now, as I understand  
8 what is referred to in Exhibit 54 as the route  
9 change that was made to accomodate the mammals, fish  
10 and birds was the dotted line going to the west  
11 side of Travaillant Lake in this map.

12 A Yes, the original  
13 route through that area that was modified could  
14 be represented, if you like, by a line that fundamentally  
15 cuts through the middle between the dash line on  
16 the prime route and the solid line showing the  
17 cross-delta route which would extend directly to  
18 Thunder Bay. The original routing through there  
19 was a line that basically went through the middle  
20 in between those two lines.

21 MR. GENEST: I think Mr.  
22 Horte meant Thunder River.

23 MR. BAYLY: When you say  
24 Thunder Bay I think you are referring to the Thunder  
25 River?

26 A Thunder River, sorry.

27 MR. BAYLY: I thought we  
28 had a new route.

29 MR. GENEST: I thought we had  
30 another alternative route.

THE COMMISSIONER: It is the  
edge of the shield route, isn't it?



V.L. Horte  
Cross-Exam by Bayly

1  
2 MR. BAYLY: Q Now, when you  
3 filed this as an alternate --

4 A Yes.

5 Q -- we note from this map  
6 that that portion of the pipeline has been moved to  
7 the east side of the lake, it doesn't go through them,  
8 but it does go to the east side rather than the west  
9 side. Was this on information from your various en-  
10 vironmental consultants?

11 A Yes, my understanding  
12 is that the environmental input to this is fundament-  
13 ally, and even back at the time when the prime route  
14 was selected, and during the period of those discus-  
15 sions, was that from an environmental standpoint the  
16 suggestion was that we should go either to the west  
17 or to the east of that area; and as you can see from  
18 this map, that is precisely what has been done. In  
19 the case of the prime route we've gone to the west  
20 side; in the case of the cross-delta route, were that  
21 the route to be selected, we would stay to the east  
22 side to avoid this environmental problem.

23 Q Now, having made this  
24 decision, and as I understand the evidence of Dr.  
25 Mollard, and without referring to a specific passage,  
26 he noted that the Travaillant Lake area would be one  
27 where borrow would be required to be brought from  
28 some of the rich deposits probably around Travaillant  
29 Lake to the pipeline. Will this affect the environ-  
30 ment and the birds and mammals and fish that you did





V.L. Horte  
Cross-Exam by Bayly

1 not want to disturb any more by taking this cross-  
2 delta alternative than by taking the original prime  
3 route?

4 A I don't know, I guess a  
5 great deal of that depends upon the time of year that  
6 it's done, and I'm not very familiar with that specific  
7 item. About all I can help you with, sir, is to tell  
8 you generally what happened, if you want to get into  
9 specifics such as that, I think that really there are  
10 people that could help you much better than I could,  
11 namely environmentalists.

12 Q All right, and can we  
13 assume then that if the cross-delta becomes a firm  
14 proposal, that we will get another chance to ask the  
15 people who know about borrow facilities and this sort  
16 of thing?

17 MR. GENEST: I think, Mr.  
18 Bayly, that regardless of whether the cross-delta  
19 alternative becomes a firm proposal, we'll have that  
20 evidence.

21 MR. BAYLY: Thank you, sir.

22 Q Now, Mr. Horte, have your  
23 environmentalists given you any opinions as to whether  
24 a single additional year is sufficient time to assess to  
25 your standards the cross-delta proposal from an environ-  
26 mental point of view?

27 A Yes, the opinion I have  
28 from our director of environment, Mr. Hemstock, is that  
29 with the studies that are going to be undertaken this  
30 summer and completed this summer, they feel we will have





V.L. Horte  
Cross-Exam by Bayly

1 a good assessment of environmental aspects of the  
2 cross-delta route.

3 Q I take it then that  
4 some of this work has already gone on?

5 A Yes, a certain amount,  
6 and there has been work done by others, some of which  
7 we have acquired in that area.

8 Q If I were to suggest that  
9 there might be the kind of happening in the Shallow  
10 Bay -- and I'll give you this as an example -- that  
11 for example the whales wouldn't come in the way they  
12 usually do, would that make it impossible for you to  
13 complete it in the one year? Would you have to wait  
14 until an additional season had passed?

15 A Well, I can't be that  
16 specific with respect to the beluga whale situation,  
17 I do know that a good deal of study has been done in  
18 this area. A study was undertaken by certain oil  
19 companies, I think it's referred to as the Slaney  
20 Report where Dr. Slaney has studied this area. We  
21 have acquired and paid for that information and it  
22 will only be really augmenting that information, the  
23 work being undertaken by us this summer as it pertains  
24 at least to the beluga whale. Again, I think that  
25 the question in depth could better be put to one of  
26 our environmentalists; but my understanding is that  
27 they feel that they will have, at the end of this  
28 summer, sufficient information with respect to that  
29 route to make a good environmental impact assessment.

30 Q And I'm assuming then



V.L. Horte  
Cross-Exam by Bayly

1           if  
2   that there is some area that they feel has not been  
3   adequately covered because of some happening during  
4   the summer, or lack of happening, that you will need  
5   that additional information to come forward after?

6                   A     I'm sure that that would  
7   then have to be brought out, if that were the case.

8                   Q     All right. Now in this  
9   cross-delta alternative proposal, did you or do you  
10   plan to contact local people to get advice from them  
11   on the proposal and their understanding of the habits  
12   of the various life species that use this area?

13                  A     I can't answer that  
14   question directly. I'm not sure what all the environ-  
15   mentalists do in assessing that environmental aspect.

16                  Q     All right. Well, is it  
17   fair to say then that Arctic Gas does not give any  
18   direction to its consultants about this sort of thing?  
19   You give them a free rein, you don't say, "Go and  
20   consult the local people, or don't go and consult the  
21   local people."

22                  A     Well, we hire the best  
23   experts we know of in this area, and certainly to a  
24   great extent we have to rely on their judgment in the  
25   environmental area, and we do rely on their judgment.  
26   We think we have some very excellent people in this  
27   area, and that they, in being scientific and going about  
28   it in a proper way, that they will get all the inputs  
29   that they think can be helpful.

30                  Q     All right. Well in answer  
31   to my question, though, I understand that you don't





V.L. Horte  
Cross-Exam by Bayly

1 do this kind of --

2 A We don't direct them  
3 specifically to go and talk to people in the area about  
4 the environmental aspects. I'm sure they do a certain  
5 amount of this, but I can't be more specific than that.

6 Q All right, I'm just  
7 interested in Arctic Gas' actual input, and it appears  
8 to be none, that you leave the consultants to do their<sup>work</sup>/

9 A Well, Arctic Gas' input  
10 is that the director of environment for Arctic, he  
11 is an Arctic Gas man.

12 Q All right, but you don't  
13 give a policy direction as to how they should do their  
14 work. You leave them to do it in the best professional  
15 way they know how.

16 A Yes sir.

17 Q Now, to your knowledge,  
18 Mr. Horte, when it was realized that the pipeline could  
19 not be built without crossing and affecting a large  
20 number of traplines, right down the Mackenzie and in  
21 the delta area, was a decision made by Arctic Gas  
22 to consult or not to consult with the trappers or  
23 their associations?

24 A No, I think -- again I  
25 think that someone else can go into this in more  
26 detail, but I do know that we did consult with as many  
27 of the Trapping Associations<sup>et cetera</sup> as possible that would  
28 talk to us. We tried to map all the trapping areas  
29 etc. along the Mackenzie in the course of those studies.

30 Q All right now, is this





V.L. Horte  
Cross-Exam by Bayly

1 sort of thing done when you build a facility in the  
2 south? Do you go to the people who -- I know they  
3 don't trap so much, although perhaps in places like  
4 northwestern Ontario they do; but do you go to the  
5 farmers and say, "We're thinking of putting a facility  
6 through here. Here is the route. It happens to go  
7 through this field of yours."

8 A Yes, certainly when  
9 you're acquiring right-of-way you have to talk to  
10 all the landowners whose land you're crossing.

11 Q All right now, do you  
12 just talk to landowners, Mr. Horte, or do you talk to  
13 people with an interest in land in terms of using land  
14 for say registered traplines or fishing spots, this  
15 sort of thing?



V.L. Horte  
Cross=Exam by Bayly

1 A I can't be specific  
2 on that. As you know, all applications in connection  
3 with pipelines in southern Canada and during the  
4 history of those applications they have all had  
5 to be approved by a regulatory body. The hearings  
6 are open and public hearings where representation  
7 is often made by parties. The hearings are advertised,  
8 the location of the pipeline specifically is advertised.  
9 Parties do attend those hearings that have particular  
10 questions or problems associated with the routing  
11 of the pipeline, their submissions are heard and  
12 in the final analysis the regulatory body approves,  
13 sometimes with change, the facilities that are  
14 suggested.

15 Q Now, to get into the  
16 area of trap lines, has Arctic Gas contemplated  
17 the possibility of compensating people whose livelihood  
18 is affected by the construction of a pipeline or  
19 other facilities in areas that they have traditionally  
20 used to make their living?

21 A I think like any other  
22 pipeline to the extent that people are affected  
23 and compensation is due, certainly we recognize that.

24 Q Now, when you say  
25 "you recognize that, do you mean you recognize that  
26 as the responsibility of the builder of the facility  
27 or somebody else's responsibility?

28 A As a builder of the  
29 facility.

30 Q Now, taking a specific/  
example





1 of a facility, I am referring to a compressor  
2 station site that Mr. Williams now knows of at  
3 Big Eddy --

4 A Sorry, where is that?

5 Q Big Eddy, on the  
6 west side of the delta. Perhaps Mr. Williams could  
7 be asked to point that out to Mr. Horte.

8 MR. SCOTT: By the end of  
9 this hearing we will have discovered all of Mr.  
10 Bayly's favorite fishing and hunting grounds.

11 MR. WILLIAMS: Is that  
12 CA-08?

13 MR. BAYLY: I believe so,  
14 yes.

15 Q Now, Mr. Horte,  
16 it has come out in evidence both in the formal  
17 hearings and in the community hearing held in  
18 Aklavik that there is some concern about locating  
19 a compressor station at that spot since it is a  
20 traditional and productive fishing spot for the  
21 people of Aklavik. What I am wondering is, because  
22 I am interested how the process of decision making  
23 is made by Arctic Gas, has this information reached  
24 you, that this is a concern?

25 A Certainly there  
26 are these concerns. I can't -- Certainly I hear  
27 about these concerns and what is being done about  
28 them. I can't be specific with respect to the one  
29 you mentioned here.

30 Q All right, now, we have



V.L. Horte  
Cross-Exam by Bayly

1 had some evidence from the Purcell panel, among  
2 others, that it is difficult to move compressor  
3 stations, but that it is possible and what I would  
4 like to know is --

5 THE COMMISSIONER: YOU moved  
6 them on the plan.

7 MR. BAYLY: Oh, yes, I don't  
8 mean lifting them up and moving them, sir, -- I meant  
9 to relocate them.

10 Q What I am interested  
11 in knowing, sir, is if there is to be a response  
12 to this kind of concern is it likely to happen at  
13 this stage or will it not likely happen until after  
14 the conclusion of these hearings? In other words,  
15 when does Arctic Gas plan to respond to the kinds  
16 of concerns that the people of Aklavik have expressed  
17 about the location of this facility at Big Eddy?

18 A Well, a compressor  
19 station move is of course much more difficult,  
20 in that this spacing has to do with the distance  
21 in which you can move gas. The distance you can  
22 pump it and continue with an efficient system.  
23 In other words, if you change the spacing a great deal  
24 you would change the throughput of the pipeline.  
25 Certainly within a mile or two, although it does  
26 have some effects. I think there is room to  
27 move these stations. Otherwise its -- if it were  
28 changed much it could result in a change at compressor  
29 station spacing all the way down the pipeline.

30 Q I realize that this would





V L. Horte  
Cross-Exam by Bayly

1 then perhaps have a house of cards effect and  
2 somebody down -- or up river might say, you have  
3 moved the other compressor station into a place  
4 that we don't like.

5 A Yes, right.

6 Q It is possible  
7 though to move it a certain distance.

8 In answer to the other part of the question, sir, I  
9 realize the difficulty in moving this kind of  
10 facility. Can you give me an idea of what sort  
11 of policy Arctic Gas is likely to adopt about  
12 responding to concerns that are brought up in  
13 these hearings?

14 A You can't just generalize  
15 on something like that. I'd say that we are prepared  
16 to look at anything that is suggested and respond  
17 to it and advise whether or not we think that is  
18 feasible or whether that can be done.

19 Q Alright, now, in response  
20 to the line of questioning that Mr. Bell had put  
21 to you yesterday on roads you said that you would  
22 fix up roads reasonably if required to do so. Is this  
23 sort of concern that I have expressed about this  
24 compressor station something you would do if required  
25 to do so, or would it be something that Arctic Gas  
26 could contemplate doing voluntarily without it  
27 being a condition of the granting of the right-of  
28 way?  
29  
30



V.L. Horte  
Cross-Exam by Bayly

1                   A       I think it's something  
2       in this case, within a limited distance, something we  
3       could agree to voluntarily, if that were deemed to  
4       be desirable.

5                   MR. BAYLY: All right.

6                   THE COMMISSIONER: Before we  
7       leave this, M r. Bayly, the questions you're putting  
8       relate to the procedure that we will be following,  
9       at least that I expect we will be following, and which  
10      I asked all parties to consider yesterday. It seems to  
11      me that if you're going to say that the compressor  
12      station at Big Eddy ought to be ten miles farther  
13      away, than it is, then you should be prepared whenever  
14      we get to arguing about terms and conditions, to put  
15      that forward as one of the terms and conditions you  
16      want imposed.       In the meantime, there's nothing wrong  
17      with doing as you have, putting Arctic Gas on notice  
18      that you're going to be asking for that so that they  
19      can begin to concern themselves with the question,  
20      "Will we move it? Can we move it?"

21                                ,                   If they can't, they had  
22      better be able to come back here and in due course say,  
23      "Well, we can't move it, it's impossible," and be  
24      prepared to justify it.

25                                Now that's the way I envisage  
26      us working these problems out,

27                   MR. BAYLY: I'm quite prepared  
28      to recommend that, sir. I see the difficulty in just  
29      recommending it, that it may be at that point in a  
30      sense too late to come back and hear evidence on why





V.L. Horte  
Cross-Exam by Bayly

1 not. What I want --

2 THE COMMISSIONER: Yes. Well,  
3 we have to struggle with that, but for instance, I  
4 think Arctic Gas knows very well now that you're going  
5 to fight to have that compressor station moved out of  
6 there, and that is an issue that is now clear-cut, and  
7 good luck to both of you.

8 MR. GENEST: Well, may I  
9 interject, sir? We know what Mr. Bayly wants to do  
10 with that compressor station. But until we hear what  
11 other people want to do with other compressor stations,  
12 it's hard for us to give an answer. A move there may  
13 affect a move down -- we may end up in somebody else's  
14 Big Eddy.

15 THE COMMISSIONER: That's true,  
16 that's why the community hearings are going to be so  
17 important, and --

18 MR. GENEST: I might add, sir,  
19 that we like to hear these concerns. My view of the  
20 Aklavik hearing, from that point of view, was, if I  
21 may respectfully say so, disappointing in the sense  
22 that we heard the, very strongly the position taken by  
23 the native people as to their land claim settlements,  
24 and their dislike, if you like, of the pipeline; but  
25 we heard very little of the kind of suggestion that  
26 you're talking about relating to terms and conditions.  
27 We would hope that in other community hearings we get  
28 more of that input.

29 MR. BAYLY: Well, Mr. Commis-  
30 sioner, I think it's fair enough for Mr. Genest to think



V.L. Horte  
Cross-Exam by Bayly

1 that but we haven't made that sort of comment about  
2 any failures we felt in his panel to respond to the  
3 questions that we're interested in.

4 MR. GENEST: I'm sorry, I  
5 didn't mean to be provocative. I understood the posi-  
6 tion of the people of Aklavik quite well, but we didn't  
7 get the concerns that they would have if they failed  
8 in their first argument. Perhaps it's difficult for  
9 people to understand what lawyers understand are  
10 arguments in the alternative.

11 M R BAYLY: I think that may  
12 be one of the problems.

13 A If I could, I'd like to  
14 add to the comment made by Mr. Genest. I think that  
15 it is very important and difficult for us to respond  
16 to every suggested move. I think we need -- you know,  
17 there is an accumulative effect of these things and  
18 I think we really need to look at them as a package,  
19 as a total, and then see what the overall impact would  
20 be. It would be great for us to say, "Yes, we can  
21 move this or we can move that," and find that when  
22 we put it all together we can't live with it. So  
23 you do have to look at it in totality, in my opinion,  
24 in most cases. I'm sure there are instances where  
25 this is not true.

26 THE COMMISSIONER: Well, I  
27 think we all appreciate that, Mr. Horte. The trouble  
28 is we won't know until the last community hearing is  
29 over and until the last witness at the formal hearings  
30 has left the stand, we won't have the totality of the





V.L. Horte  
Cross-Exam by Bayly

1 evidence before us; but in the meantime I know you  
2 will be thinking about these things.

3 A We will be looking at  
4 it piece by piece as we get a feel for the situation,  
5 yes.

6 MR. BAYLY: I'm suggesting too,  
7 Mr. Commissioner, that this<sup>in a</sup> sense is no different  
8 from the process that I understand Mr. Horte to say  
9 that Arctic Gas goes through when it gets a number of  
10 consultants to decide whether or not environmentally  
11 they can cross the delta. That is before the totality  
12 of the evidence is in.

13 Q Now, with regard to  
14 campsites, Mr. Horte, and I'm referring to the big  
15 camps that will be set up--

16 A Construction camps?

17 Q -- construction camps,  
18 yes.

19 A Yes sir.

20 Q Do you know whether  
21 Arctic Gas consulted people in the nearby communities  
22 about locations of construction camps, and whether  
23 their concerns were catalogued and taken into consider-  
24 ation in the location of these camps?

25 A Well, I do know that  
26 there was input from our sociological consultants who  
27 did make visits to those communities, people that --  
28 of our own staff who have visited those communities and  
29 these factors were taken into account.

30 Q All right.



V.L. Horte  
C ross-Exam by Bayly

1 A I don't know how -- as  
2 I mentioned yesterday -- frankly how good these inputs  
3 were. There was a period of time in which there  
4 appeared to be an ability to communicate and get some  
5 inputs. Then we reached the point in time where it  
6 appeared as though we were really not welcome in the  
7 communities to discuss these matters, and so it hasn't  
8 been an easy problem, easy to necessarily get these  
9 inputs; to the extent that we obtained a feeling of  
10 those inputs, we tried to reflect them.

11 Q All right now, could  
12 you tell me how you would -- if I can give you just an  
13 example -- how you would respond to it. Assume that  
14 a community said, "The camp that you have placed within  
15 five to ten miles of us is too close, and it's in a  
16 spot that we like to go to trap muskrats. Could  
17 you move it?" Would your approach to that be to con-  
18 template suggesting that you could put it in several  
19 other places, or would you just leave it and just  
20 realize that was a concern? How would you propose  
21 to deal with that sort of concern?

22 A Well, you would look at  
23 that concern, along with the other concerns, that  
24 being of the environmental concerns, the straight  
25 engineering concerns, the cost concerns associated  
26 with that, to the extent that within all that you could  
27 accommodate to this, then certainly you would try and  
28 do so.

29 Q What I am suggesting,  
30 sir, is that there are participants in this Inquiry





V.L. Horte  
Cross-Exam by Bayly

1 who may express their concerns in that way, that,  
2 "We don't want it there." I am suggesting -- and  
3 you can either accept this or reject this -- that the  
4 onus is then on Arctic Gas to suggest some alternatives.  
5 It isn't on the other participants to say, "It should  
6 go there or here," because the other participants may  
7 not have the expertise, the kinds of economic concerns,  
8 etc., or facilities location concern that Arctic Gas  
9 may have, so they are not in an informed position to  
10 suggest the alternatives that they perhaps are expecting.

11 A I agree with that.  
12 I think we have to respond.

13 Q All right, now when you  
14 say you have to respond, have you contemplated methods  
15 of responding that will be meaningful to the communities  
16 so that they will have a chance to consider your  
17 responses and perhaps react to them?

18 A Not really. I must say  
19 that my own feeling on this has been that during the  
20 course of these hearings, as we're doing here now, we  
21 will get a feel of this situation, as the Commissioner  
22 suggested yesterday, he's looking for this kind of  
23 input from these various areas, from the standpoint of  
24 conditions that people think should be imposed. We are  
25 going to have to respond to that sort of thing and  
26 explain why we think it is desirable and that it  
27 is feasible to do what has been suggested, or why it  
28 is not, or why some other alternative might be a situa-  
29 tion that at least partially responded to the problem.

30 Q Well, if I --



V.L. Horte  
Cross-Exam by Bayly

1                                   A     Now, my problem is,  
2     are we going to go round the circle again, you know,  
3     somewhere? How long a process is this?

4                                   Q     Well, I think we share  
5     that concern, sir, and one of my reasons for this line  
6     of questioning is that I can contemplate the possibility  
7     of having to go back into communities a second time  
8     for you to present what may be alternatives. Now I  
9     don't think that's something<sup>(a)</sup> that we want, (b) the  
10    communities want, and (c) that you want, if it can be  
11    avoided. I'm trying to see if you've thought of a  
12    way as Arctic Gas to avoid this dilemma, which we  
13    may well be faced with following each community hearing.

14                                  A     No, I haven't. Certainly  
15    it's something that maybe we should consider, but --

16                                  Q     Now, back again, Mr.  
17    Horte, to the subject we were discussing yesterday of  
18    gas supply to the various communities.

19                                  A     Yes sir.

20                                  Q     Now, was each community  
21    in the region adjacent to the pipeline, that is the  
22    Mackenzie Valley and delta, approached with regard to  
23    its desire to have gas supplied as a fuel by Arctic  
24    Gas?

25                                  A     I can't be sure of that,  
26    sir. I think it was taken for granted that basically  
27    if it could be made available that people would want it.

28                                  Q     Well, I'm afraid your  
29    answer has confused me, Mr. Horte. I gather you don't  
30    know whether that approach was taken, but you do know





V.L. Horte  
Cross-Exam by Bayly

1 that the assumption was made--

2 A Yes.

3 Q -- that people would want

4 gas.

5 A Yes.

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1 Q And did Arctic Gas  
2 receive any guidelines from the Government with regard  
3 to gas supply to communities in the Mackenzie?

4 A I think we were informed,  
5 certainly in discussions -- informal discussions with  
6 the Department of Indian and Northern Affairs that  
7 this was an area that they certainly indicated  
8 they wanted carefully considered.

9 Q Is that as far as  
10 they went? Did they mention specific communities  
11 or all the communities or --

12 A I think that they  
13 wanted to see certainly what the likelihood was of  
14 serving gas to communities and along the route of  
15 the pipeline.

16 Q Were you involved in  
17 these discussions yourself?

18 A In some of them,  
19 yes.

20 Q And could you tell  
21 us with whom you discussed these at Indian Affairs?

22 A I can recall conversations  
23 with Mr. Hunt in this connection.

24 Q And is that the only  
25 person that you recall conversing with on this subject?

26 A There were others in  
27 attendance at those meetings. I can't be specific  
28 as to who they were. I think that Mr. Yates at one  
29 of them -- I just can't recall the persons. There  
30 were more than one -- there was more than Mr. Hunt



V.L. Horte  
Cross-Exam by Bayly

1 at the meeting -- two or three other officials.

2 Q All right, was this  
3 a meeting at which minutes were kept or at which  
4 a transcript was taken?

5 A No.

6 Q So there is no record  
7 of this meeting except what you have in your own  
8 mind about this discussion?

9 A Yes.

10 Q And was this a  
11 discussion initiated by you or one that was  
12 initiated by Mr. Hunt or one of his staff?

13 A I can't tell you  
14 specifically how it was initiated. We have meetings  
15 from time to time, head meetings in connection with  
16 filing the applications, etc., as we have had  
17 with all regulatory bodies during the course of  
18 these meetings. Certainly often many matters  
19 are discussed.

20 Q All right, and  
21 is your statement of yesterday that you would  
22 supply gas to the communities if required to do so as  
23 a requisite to getting your regulatory approval or  
24 that you would do so if the Government were to  
25 pick up some of the subsidy costs, a result of this  
26 discussion?

27 A No, they are not, sir.  
28 Those are strictly our own policy and philosophy with  
29 respect to it.

30 Q So you had no





V.L. Horte  
Cross-Exam by Bayly

1 agreement with --

2 A Never have had --

3 Q -- Indian Affiars about  
4 that?

5 A No, sir.

6 Q Now, Mr.Horte , if  
7 I could refer you to page seven of your prepared evidence.

8 A Yes.

9 Q And I am referring  
10 to the item number three, pipeline sizing --

11 A Yes, sir.

12 Q In that paragraph, the  
13 second sentence you say:

14 "Generæly providing gas volumes are  
15 available to justify its sizing,  
16 the larger the diameter of a pipe,  
17 the more efficient or more economical  
18 the transportation of gas through  
19 such a pipeline becomes."

20 Now, we had questioned, I believe it was Dr. Clark,  
21 about the effects of chilling on the economics  
22 of the transportation of gas, and he gave an  
23 answer that I found rather puzzling, saying, "that  
24 economically it did not make much difference whether  
25 you chilled the gas. It is just my rudimentary --

26 MR. GENEST: Mr. Purcell  
27 made a similar -- I think that was thoroughly gone  
28 into with Mr. Purcell who was the economic man on  
29 it and the evidence is clear that the decision  
30 was a geotechnical one. It didn't -- the economics



1 of throughput were marginal and --

2 MR. BAYLY: I had not  
3 considered, Mr. Commissioner, that Mr. Purcell was  
4 an economics man. I considered him a scientific  
5 man and I was wondering if Mr. Horte as definitely  
6 an economic man will confirm what Mr. Purcell  
7 says --

8 MR. GENEST: You just  
9 wanted a confirmation.

10 MR. BAYLY: -- Or if he --

11 MR. GENEST: Oh, I am  
12 sorry, I thought that the record was quite clear  
13 on that.

14 MR. BAYLY:

15 Q Is that your understanding,  
16 sir?

17 A Would you repeat the  
18 question. I have just lost in the conversation  
19 exactly what the question was.

20 MR. GENEST: So that  
21 is how clear I was.

22 MR. BAYLY:

23 You want to use a big  
24 pipeline so that you can move more gas?

25 A Yes, sir.

26 Q But you don't want  
27 to chill the gas because you want to move more gas,  
28 you are chilling it for other reasons, for  
29 geotechnical reasons?

30 A No, fundamentally the





V.L. Horte  
Cross-Exam by Bayly

1 chilling aspect of this pipeline was for  
2 permafrost reasons so that you would have a secure  
3 pipeline in going through the permafrost, that  
4 you kept the temperature of the pipe below the  
5 temperature of the permafrost so that you would  
6 not create a thaw condition.

7 Q Yes, I realize that  
8 sir.

9 A Now, in the cooling  
10 process itself, while it is a very expensive  
11 process there are some benefits that result so that  
12 it is not all an expense .

13 In other words, if  
14 you are moving a gas that is cooled, it occupies  
15 less volume, the same cubic foot occupies less  
16 volume and therefore more Mcf's can be put through  
17 the same pipeline operating at a low temperature  
18 than they could if that pipeline were operating  
19 at a higher temperature, so this partially at least  
20 offsets some of the costs associated with the chilling  
21 process itself. But let's take for example, in southern  
22 Canada where you do not have the permafrost problem,  
23 you would not go into this chilling process. You  
24 would simply cool the gas on a big transmission line  
25 sufficiently that you didn't get a cascading effect,  
26 so that the temperature got higher and higher and  
27 higher as you went from one compressor station to the  
28 next.

29 Q All right, so if we  
30 take the balance then you say that it costs more



V.L. Horte  
Cross-Exam by Bayly

1 to chill it than the benefits that are involved?

2 A Yes, sir.

3 Q Now, referring  
4 to page 12 of your prepared evidence --

5 A Yes .

6 Q I am referring to the  
7 second paragraph. First of all to the -- and I  
8 won't read the sentence, but basically you say  
9 that you will have to increase the size of the  
10 right-of-way perhaps from 15 to 20 feet in order  
11 to loop the line, would that be fair to say?

12 A Yes.

13 Q Have you contemplated  
14 how far apart the two pipes would be on the loop  
15 line?

16 A Not specifically  
17 exactly the distance. I think that the distance  
18 would probably not be over a distance of 30 feet,  
19 and maybe less.

20 Q I assume when you  
21 do this kind of additional construction that  
22 additional borrow is required to do this kind of  
23 work, is that true?

24 A Well, to the extent  
25 that borrow is required in connection with the  
26 laying of that second line, yes, sir.

27 Q Now, you stated earlier  
28 in cross-examination that much of the study  
29 on looping as to its impacts and its requirements  
30 have not been done. Have you initiated studies in



1 contemplation of looping that would suggest whether  
2 or not ~~there~~ is enough borrow facility for the  
3 additional line caused by looping?

4 A Not to my knowledge.  
5 sir.

6 Q So would it be fair to say  
7 that you don't really know whether there is sufficient  
8 borrow in some areas to put the looping in ?

9 A I don't know, sir,  
10 I -- maybe some of our technical people do.

11 Q All right, now, when  
12 was this decision or judgment that looping  
13 would very likely be required, made by Arctic Gas?

14 A Well, you know, it is  
15 no major decision. I think that when you just  
16 look at the potential of the area that we are  
17 going into, you have to contemplate that there may  
18 well be looping. Now, whether there is or not, is  
19 a fact that nobody today can tell. This will only  
20 be unfolded as the development in the area indicates  
21 that there in fact is -- that the potential that  
22 people believe is there, is in fact being realized.

23 Q All right, you are saying  
24 that then as an experienced person in the field that  
25 it has always looked like ~~there~~ was a good enough  
26 potential that looping would be a sensible  
27 thing to contemplate at some point?

28 A Yes, I think that that  
29 is certainly something you have to keep in  
30 mind, yes.





V.L. Horte  
Cross-Exam by Bayly

1 Q Well, could you look  
2 at exhibit 54 then, please, sir, and I am referring  
3 you to 8-B. 2, at page 4. Sorry, 8-B. 1.2.,  
4 page four.

5 A Page 24?

6 Q 8-B -- I guess it  
7 is under tab decimal 2.

8 MR. GENEST: It is the  
9 second bright red or dark red tab.

10 A Yes, sir.

11 MR. BAYLY: It is under  
12 "systems configuration" and it is on page 4 of  
13 that section.

14 A I have 8-B -- then  
15 there is a pink tab --

16 Q There is a pink  
17 tab one and then there are two white tabs. It is  
18 the white tab decimal 2.

19 A Yes. sir. Page 4?

20 Q Page four, yes.

21 A Yes.

22 Q Looking at the last  
23 paragraph but not including the one with the  
24 single sentence in it and may I read that paragraph  
25 to you:

26 "For the two gas supply lines, 42" pipe, will  
27 provide a comparable cost of service to that  
28 of 48" pipe at <sup>the</sup> fifth year design volumes.  
29 The optimum capacity of 42" pipe is approx-  
30 imately 3,250 ..."

What are two M's?



V.L. Horte  
Cross-Exam by BAYly

MR.GENEST:Billion.

Q Billion?

A No , 3,250 million

which is 3 billion 250.

Q All right, 3,250,000,000

cubic feet per day?

A Right.

Q Compared with

four billion and a half cubic<sup>feet</sup> for 48" pipe.

"48" pipe was selected because of the

greater excess capacity it provides."

And this is the sentence coming up that I am interested  
in.

"The applicant is confident that this  
additional gas will become available  
and can then be transported without  
the need for looping."





V.L. Horte  
Cross-Exam by Bayly

What puzzles me, Mr. Horte, is that Arctic Gas is made up of experienced people in the field, why it would make an application with a statement like that in it in light of your evidence?

A Well, to the extent that this additional capacity, that is as I see it, the difference between 3 billion 250 and 4 billion 5, we feel confident that <sup>that</sup> amount of gas will be available. At least to that extent, and to the extent of that difference you wouldn't require any looping during that period.

Q All right, so any misunderstandings that I have had about the need for looping arrives from that interpretation of this paragraph?

A        Yes, I think that's how  
you have to interpret that.

THE COMMISSIONER: Well Mr. Bayly, before you leave that, what is it that you don't understand, because I don't think I understand it either. .

MR. BAYLY: Mr. Commissioner, when I read that paragraph the first time, and as a matter of fact when the information was taken to the communities, it was that they were using a 48-inch pipe because they didn't need to loop it so they would only build once. Now it turns out that that paragraph doesn't mean that at all. It means that they won't need to loop when they get to 3 1/4 billion cubic feet per day, they won't have to loop until they



V.L. Horte  
Cross-Exam by Bayly

1 get to 4 1/2 billion cubic feet per day.

2 THE COMMISSIONER: I under-  
3 stand.

4 MR. BAYLY: As Mr. Scott says,  
5 they won't have to loop till it's full.

6 THE COMMISSIONER: They won't  
7 have to what?

8 MR. BAYLY: Loop until the line  
9 is full, and this line takes longer to get full.

10 Q Would that be fair to say?

11 A Yes.

12 Q And I assume that from  
13 your evidence when you loop a line like this, you loop  
14 it until the line is twinned all the way before you  
15 start looping time three, if you should ever need to  
16 do that?

17 A You loop it first, and  
18 then you power it up. As you know, the loop itself  
19 only would increase the capacity on -- as shown on  
20 the diagram the other day, on a 48-inch by about 55%.  
21 The additional 45% increase in capacity is brought about  
22 by the duplication of the horsepower.

23 Q So you add compressor  
24 stations after looping?

25 A Yes.

26 Q And what I'm asking is,  
27 would you just loop to make two lines before adding  
28 compression, or might you loop and add three lines  
29 before adding compression?

30 A No, you'd definitely



V.L. Horte  
Cross-Exam by Bayly

1 add compression before you started looping again.

2 Q All right, and as you  
3 stated, there's no way of telling at this point whether  
4 you might have to loop a third time, that would depend  
5 on new gas discoveries.

6 A Yes, it would.

7 Q All right.

8 A It would take a lot of  
9 gas.

10 Q Yes. Now looping a third  
11 time sounds like a tremendous amount, but as I under-  
12 stand, there are gas pipelines in Southern Canada that  
13 have been looped more than three times.

14 A Yes, but they didn't  
15 start off with an initial capacity of 4 1/2 billion  
16 cubic feet a day. For instance, the Trans-Canada system  
17 going from Alberta to Winnipeg was initially built with  
18 a 34-inch line, looped to Winnipeg with a 36, then  
19 looped again with 36, and is now being looped with a  
20 42, with the loops not having been completed. When  
21 you put all those volumes of gas together, that system  
22 is still not moving 4 1/2 billion cubic feet a day.  
23 So this demonstrates the advantage, certainly in this  
24 country, of going as big as you can.

25 Q All right now, you made  
26 a statement here about impacts, and if I can read that  
27 to you, because I find it a bit confusing.

28 "Very few, if any, additional operational  
29 impacts would occur. I think it also obvious  
30 that further impacts on an already -- on an





V.L. Horte  
Cross-Exam by Bayly

1 area already impacted upon will be of less  
2 environmental and sociological significance."

3 Now is that an opinion which comes to you from your  
4 consultants, or is that your own personal opinion?

5 MR. GENEST: We had that  
6 very question before, Mr. Bayly. That exact question.

7  
8 MR. BAYLY: Well, I'm leading  
9 to another question, Mr. Commissioner. I assume the  
10 answer -- and as a matter of fact, I don't think we  
11 have had an answer to that question. We haven't had  
12 an answer as to where it came from.

13 MR. GENEST:  
14 Mr. Horte said it came  
15 from his own judgment.

16 MR. BAYLY: All right.

17 Q If that is your own  
18 judgment, sir, is it?

19 A Yes, it is.

20 Q All right, I hadn't  
21 heard it.

22 A I stated that yesterday.

23 Q If that is your own  
24 judgment and if I were to suggest to you, for example,  
25 an environmental impact that you will lay a line, then  
26 you will re-vegetate the area, and according to your,  
27 not schedule, but according to your gas predictions  
28 and the volume that we were shown yesterday or the  
29 day before, you stated that somewhere around the year  
30 1985 it would be necessary to begin looping.

A Based on those projections,



V.L. Horte  
Cross-Exam by Bayly

1 yes.

2 Q All right, and I assume  
3 if the predictions that I have in my mind about  
4 construction are correct, that this would follow  
5 construction and re-vegetation -- actually follow  
6 re-vegetation by about three years.

7 A About four years, I  
8 think.

9 Q All right, by about  
10 four years. Now, if I were to suggest to you, for  
11 example, sir, that re-vegetating, with what your plant  
12 people call pioneer species, involves planting a species  
13 which is far more prone to damage, if disturbed  
14 before it has had a chance to establish, would you  
15 know whether or not that were true?

16 A Well, I think that our  
17 opinion is that we can establish good cover rather  
18 quickly over the disturbed area. If we were to prove  
19 wrong in this, I guess your point is would this have  
20 an effect on the looping, and certainly this would  
21 have to be considered. You know, we're not going to,  
22 because we obtain approval to build this project,  
23 doesn't mean that we have the right to go and build  
24 the loop line. Any application on a public utility  
25 on a pipeline such as this, every time you add a nut or  
26 bolt to that facility you really have to get it  
27 approved by the appropriate regulatory bodies, and  
28 they have to consider all the factors as to whether  
29 or not this is in the public interest or not.

30 Q All right now, assuming



V.L. Horte  
Cross-Exam by Bayly

1 that you go back and you do your looping and you  
2 cause some kind of damage that you don't mean to cause,  
3 but it happens and you're prepared to fix it up so that  
4 it looks like new again, is that a cost that goes into  
5 the rate that everybody pays for the gas?

6 A Yes.

7 Q And I assume -- I'm not  
8 just referring to looping -- but costs of any environ-  
9 mental damage at any stage in the project are things  
10 that go into the cost of the gas. Is that fair to say?

11 A Anything that involves  
12 costs on behalf of the company in carrying out its  
13 function is normally either incorporated into rates as  
14 operating cost, or as part of the fixed cost, in  
15 which your rates are set.

16 Q All right, are your rates  
17 set prior to construction or not until after?

18 A Well, in the case of  
19 this project and the size of it, what we are suggesting  
20 in terms of rates is that it's a cost of service  
21 rate, that all our costs will be incorporated and  
22 it will be completely recoverable in the rates. So  
23 it wouldn't necessarily be fixed, it would be dependent  
24 upon what those costs would actually be, and it wouldn't  
25 be fixed prior to construction of the pipeline, although  
26 it would be estimated.

27 Q All right, so in that  
28 sense we cannot know sort of what costs people would  
29 pay for this gas until we've seen what this entire  
30 project has cost.





V.L. Horte  
Cross-Exam by Bayly

1 A Not precisely.

2 Q All right.

3 A That isn't peculiar to  
4 this pipeline.

5 Q Say that again,

6 A That isn't peculiar to  
7 this pipeline.

8 Q Mr. Horte, I'm just  
9 thinking about that answer. Can you fill it out a  
10 bit, because --

11 A Yes, let's take the case  
12 of Trans-Canada Pipeline. As they add facilities to  
13 that system, they estimate the cost at the time they  
14 obtain the approvals, they put in the facilities, and  
15 then periodically they go to that same regulatory  
16 body in connection with their rates and have incorpor-  
17 ated into their rates the costs associated with  
18 providing that service. You've probably seen in  
19 recent years many applications -- I'm naming that  
20 company only because I'm most familiar with it --  
21 asking for rate adjustments to provide further increases  
22 in costs.

23 Q All right, and you  
24 wouldn't get into that position until you started  
25 looping, I would assume.

26 A Well, we're suggesting  
27 rather than that procedure of going back each time,  
28 that we go on the true cost of service basis, where  
29 it is similar, for example, to the Alberta Gas Trunk  
30 Line system, which operates on a contract carrier cost



V.L. Horte  
Cross-Exam by Bayly

1 of service basis where all of their costs -- operating  
2 costs and the fixed costs -- are paid by the shipper.

3 THE COMMISSIONER: One ques-  
4 tion <sup>that</sup> I have, Mr. Horte.

5 Q You said that when you  
6 looped you would likely carry it out over a period of  
7 three years.

8 A Or longer.

9 Q I know it might be  
10 longer, but you said that you would carry out the  
11 installation of the looping so that you would have a  
12 fully looped line and then you would add the additional  
13 horsepower.

14 A Yes, that isn't usually  
15 what happens. You would have to assess the economics  
16 of that. You might find a situation where you added  
17 some horsepower before you completed the looping. It  
18 would be a matter of looking at the economics of  
19 one versus the other. On the face of it, with  
20 respect to this 48, however, it would appear as though  
21 you would probably loop out before you would start on  
22 the horsepower, based on today's economics.

23 Q Well, if you carried out  
24 a three-year looping program, I think you'd then have  
25 an additional 55% capacity. To get your remaining 45%,  
26 as I recall your graph, you would install the addi-  
27 tional horsepower.

28 A Yes.

29 Q On this line, how long  
30 would it take? Would it be one season to install the



V.L. Horte  
Cross-Exam by Bayly

1 additional horsepower, two seasons? Have you considered  
2 that?

3 A I would expect that  
4 would be at least two seasons.

5 Q All right, I wonder --

6 A Maybe longer. Mr.  
7 Williams <sup>might</sup> be more helpful on that. It's a pretty  
8 big construction period.

9 THE COMMISSIONER: Well, I  
10 wonder if Mr. Williams might, when he's preparing  
11 that diagram I asked for, add on or just give us the  
12 figures for the looping, then the three years of  
13 looping, the crews that would be needed to loop. I  
14 think he gave them to us the other day, forgive me,  
15 but then if you go on two years beyond that to install  
16 the additional horsepower, how many people do you have  
17 working north of 60? What spreads are they at, and  
18 so on? I know that that takes us seven years beyond  
19 where we are now, not now, beyond the completion of  
20 construction, but I'm sure Mr. Williams knows what I  
21 mean and we might just as well have that too.

22 MR. GENEST: He tells me it  
23 would have to be on the same rough basis.

24 THE COMMISSIONER: Oh yes.

25 MR. GENEST: As his previous  
26 figures.

27 THE COMMISSIONER: Because  
28 then we're looking at a three-year program of pipe-  
29 laying, then a four-year hiatus after the completion  
30 of pipe-laying from the Richards Island field, then





V.L. Horte  
Cross-Exam by Bayly

1 you've got three years of pipe-laying again, and then  
2 you have two years --

3 A Two or three, sir,

4 Q Yes, two or three years  
5 of installing additional compression.

6 A That would be my best  
7 guess. We will certainly take a look at that.

8 THE COMMISSIONER:

9 So you've got three and  
10 four is seven, three, ten, you've got a 12-year program  
11 and what I'm really interested in is the numbers of  
12 men and the amount of equipment involved throughout,  
13 it being assumed that infra-structure and <sup>what's</sup> installed  
14 in the first three years is still there when you come  
15 back to loop it, to install additional compression.  
16 At any rate, we'll look forward to that somewhere  
17 about the 6th or 7th of June.  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30



1 MR. GENEST: 6th or 7th of?  
2 THE COMMISSIONER: June,  
3 isn't that right?

4 MR. GENEST: We'll try.

5 MR. BAYLY:

6 Q Mr. HOrte, could we go  
7 to page 16 of your prepared evidence, please.

8 A Yes.

9 Yes, sir.

10 Q Again, without reading  
11 it I am referring to the first paragraph, the  
12 one that starts, "After considering the input ....",  
13 and there you basically say that you made a  
14 trade off in order to locate various facilities  
15 at what in the application is called an appropriate  
16 distance from communities.

17 A Yes.

18 Q Now, I am not going  
19 to going to go into the part that Mr. Bell went  
20 into yesterday, but in light of your answers and  
21 your inability to tell Mr. Bell exactly what  
22 those trade offs involved from a social and economic  
23 point of view, can I safely assume that these  
24 were not made by ARctic Gas, but were made by  
25 Arctic Gas' social and environmental consultants  
26 and presented to them?

27 A Well, maybe I should  
28 review this process <sup>just</sup> once more. Because I think that  
29 the record may not be too clear with respect to  
30 this. Basically, the -- what we have tried to say



V.L. Horte  
Cross-Exam by Bayly

1 in this section, what I have tried to say in  
2 this section, that the primary consideration in  
3 the initial routing was the environmental and the  
4 engineering concerns, obviously having regard  
5 to not wanting to go closer to communities than  
6 one would normally want to go to any community  
7 with a major transmission line.

8 Following that we had the  
9 input and the review of the whole thing getting  
10 us the socio-economic input as well, in this area,  
11 in areas where we found ourselves closer than maybe,  
12 because of environmental or engineering reasons, than  
13 someone might deem desirable in those particular  
14 instances, however, we found from the standpoint of  
15 the socio-economic input that there were no  
16 major objections to the location of those facilities;  
17 so fundamentally, in the final analysis, there was  
18 no real shifts made near communities from the initial  
19 location which did include a consideration of it as  
20 a result of those socio-economic inputs.

21 Q All right, now, I don't  
22 want to make this sound unfair, but is it true then  
23 that the route was selected in the absence of social  
24 and environmental expert opinion, but that it  
25 was confirmed afterwards that it wasn't too bad  
26 by the social and economic consultants that Arctic  
27 Gas hired?

28 A Well, let's break  
29 that down. Certainly not with respect to the  
30





V.L. Horte  
Cross-Exam by Bayly

1 environmental area, the environmental considerations  
2 went into it.

3 Q I am sorry, I meant  
4 to say "economic". I did say "environmental"; you  
5 are quite right.

6 A With respect to the  
7 socio-economic, which is a less tangible area,  
8 if you like, it is difficult for me to define in  
9 initial routing just how that was considered other  
10 than to say it was not the major consideration.  
11 Obviously, in the routing of the pipeline they  
12 tried to stay a reasonable distance from communities.  
13 Having located the line, with those engineering,  
14 environmental and sociological considerations to  
15 the extent that I have described, then the route  
16 was looked at from all of those aspects again and  
17 from the standpoint of the socio - economic inputs  
18 fundamentally no changes were made in that routing.

19 Q All right, so that when  
20 Mr. Dau gave his evidence that he talked to the  
21 environmental people on his staff and he talked  
22 to his engineers, and using their input, he picked  
23 a route using his own common sense as to how far  
24 you should be from a community. He picked the route and  
25 then it was confirmed by your social and economic  
26 consultants that the route was okay?

27 A Well, he didn't  
28 pick the route alone. Arctic Gas --

29 Q I don't mean that --

30 A Arctic Gas in consultation,  
etc., continual consultation and supervision



V.L. Horte  
Cross-Exam by Bayly

1 of the whole program was very intimately involved  
2 in that. I have tried to explain as best as  
3 I can how much socio- economic input went into  
4 that prime route and it was on a rather broad  
5 basis without trying to get specific.

6 Q Allright, but let  
7 me try to just pin it down once more.

8 Your social and environmental  
9 consultants did not come into it until after the  
10 route was chosen, but since engineers are also  
11 people, and environmentalists are also people,  
12 they used their best judgment to place it an  
13 appropriate distance from communities prior  
14 to that social and economic expert consultation  
15 taking place.

16 A I think that is a  
17 pretty fair assessment, yes, sir.

18 Q All right,  
19 Now, referring on that  
20 same page to item B on trapping, hunting and fishing --

21 A Yes, sir.

22 Q Now, again, without reading  
23 that paragraph, is it fair to say that given that the  
24 prime route was sensible from economic and environmental  
25 points of view, that that prime route, it was  
26 judged, could not go anywhere in its basic valley  
27 location without interrupting some traplines, some  
28 fishing areas, some hunting areas?

29 A I think that is true,  
30 yes, sir.



V.L. Horte

Cross-Exam by Bayly

1 Q All right. And  
2 the only way to avoid that particular social and  
3 economic problem would be to locate it right outside  
4 the area used by anybody for hunting, fishing the  
5 trapping?

6 A I think it would almost  
7 mean not building a pipeline, sir.

8 Q All right, or building  
9 it somewhere where there were no people, I assume,  
10 if there were such a place.

11 A Which would be , I  
12 think anywhere you want to look, an uneconomic  
13 situation.

14 Q All right, so you  
15 felt that there was no choice in this, that you  
16 had to interrupt some of these traditional activities  
17 in order to build a pipeline in a sensible way?

18 A Yes, I don't know the  
19 extent to which, they, you know, in fact are  
20 interrupted by that because with proper  
21 environmental control, etc., we would be very  
22 hopeful that it really wouldn't interfere all that  
23 much with those traplines or hunting grounds, etc.

24 Q Now, that brings me  
25 to my next question and that is, did Arctic Gas consider  
26 at any time commissioning or doing its own research  
27 into the values of renewable resource harvesting in  
28 the area<sup>it</sup> intended to cross with its pipeline  
29 facility -- in other words, you didn't put a  
30 dollar value on the traditional pursuits?





1                   A       My understanding is that  
2       -- and I do know that some of our exhibits do  
3       try and estimate the value of the products taken in  
4       these various areas, yes.

8 A I can't be sure, sir,  
9 but that is something that I am sure will be discussed  
0 at length during the socio-economic phase four of  
1 this thing. There have been studies, you know,  
2 in what depth I can't tell you at the moment.

20 Now, if I were to suggest  
21 to you, sir, that one of the concerns that came  
22 out of the first community hearing was that some  
23 of the traditional foods were valuable, not only  
24 because the people were used to them but because  
25 you couldn't equate their value with the dollar  
26 value of what you got at the local stores, has  
27 that caused Arctic Gas to initiate any further  
28 research into the value of the land as a source  
29 of food supply?

30 A You know, I may be



V.L. Horte  
Cross-Exam by Bayly

1 corrected, but my recollection, of certain  
2 of these studies, was to try and equate the value  
3 of those food supplies and products to try and  
4 equate those as to a dollar value, in other words,  
5 that really you didn't put -- you know, there are  
6 two values, there is a certain amount of the  
7 product that is harvested and sold, which brings  
8 in revenue and another part of the product that  
9 is consumed. Well, that was considered to have  
10 an appropriate value. I mean, that part of it  
11 wasn't eliminated from the equation, if you like.

12 Q As you can appreciate, Mr.  
13 HOrte, my concern is that what happens at the community  
14 hearings gets back to you and the people who decide  
15 what should be done in Arctic Gas, because without  
16 that, and without response from you, we cannot tell  
17 whether or not they are of any effect.

18 A Well, I appreciate  
19 that, sir.

20 Q Now, Mr. Templeton  
21 want into the question of controls, that is outside  
22 Arctic Gas on the project itself when it gets  
23 going.

24 A Yes.

25 Q And Mr. Bell to a  
26 certain extent suggested that it might be wise  
27 to have some sort of outside regulatory force involved  
28 in taking care of the pipeline construction and  
29 overseeing it and I believe that -- putting the questions  
30 of the two of them together, that you basically agreed



V.L. Horte  
Cross-Exam by Bayly

1 that there would be some form of government or other  
2 authority that would oversee the pipeline, would  
3 that be a fair statement?

4 A Yes, it would.

5 Q And you did make a comment  
6 at that time that one of the worries that you have  
7 is that we will end up with an Alaska-like situation  
8 where there are several different government departments,  
9 one in charge of fish, another one in charge of  
10 mammals, another one in charge of the land, another  
11 one in charge of air and water, this sort of thing,  
12 which would so encumber the project, if you will,  
13 and I don't mean that in a derogatory sense, but  
14 there would be an awful lot of inspectors who would  
15 be answering to an awful lot of different government  
16 agencies.





V.L. Horte  
Cross-Exam by Bayly

1 A Yes.

2 Q And if I were to suggest  
3 to you that it might make more sense for there to be  
4 a single authority to oversee the project, would you  
5 agree that that might be something that Arctic Gas  
6 would wish for?

7 A That's precisely what  
8 we wish for.

9 Q All right, and do you  
10 envisage this authority as being one that is initiated  
11 and set up by the government?

12 A Yes sir.

13 Q Do you contemplate it  
14 being attached to a particular department of a parti-  
15 cular government?

16 A Yes, we do, as a matter  
17 of fact. I think that, you know, there is an authority  
18 there now with a great deal of expertise in connection  
19 with pipelining. Their Act provides that they have  
20 authority, and it would seem to me that the National  
21 Energy Board would be a logical authority -- I'm not  
22 saying that's the only way to go -- but therein lies  
23 a body that has had a great deal of experience in this  
24 area, and it would seem to me that to the extent that  
25 additional disciplines or otherwise were required,  
26 that those could be appropriately incorporated into that  
27 body and that it, to me at least, seems <sup>like</sup> the most  
28 logical one. Certainly it could be done another way.

29 Q Now, with the exception  
30 of the fact that it must report to a particular



V.L. Horte  
Cross-Exam by Bayly

1 Ministry in the Federal Government, as I understand  
2 it the National Energy Board is a distinct entity on  
3 its own. Is that your understanding of it?

4 A Well, it is responsible  
5 of course, to the Lieutenant-Governor~~in~~ in council in  
6 connection with -- under the Act.

7 MR. GENEST: The Governor-  
8 General.

9 A The Governor-General?  
10 Sorry.

11 MR .BAYLY: You can always  
12 tell a westerner. Go ahead, sir.

13 Q And what you are  
14 suggesting is the National Energy Board. Would you  
15 envisage their setting up an agency or an authority,  
16 the Mackenzie Valley Pipeline Authority, for the  
17 specific purpose of overseeing the project?

18 A Well, they already have.  
19 My understanding is that within that Act they would  
20 have that authority.

21 Q All right, when you say  
22 "They already have," you mean they already have that  
23 authority, not that they have already set up such an  
24 organization.

25 A Not necessarily for this  
26 project, but they have that type of authority in  
27 connection with the construction of interprovincial  
28 transmission, gas and oil transmission facilities.

29 Q But you would envisage  
30 a particular, if you will, body set up by the National



V.L. Horte  
Cross-Exam by Bayly

1 Energy Board that would have specific jurisdiction  
2 over all the various aspects of the Mackenzie Valley  
3 Pipeline project.

4 A I don't know how you  
5 define "particular." I'm just saying that that be  
6 the authority that looks after all of these aspects.

7 Q And I take it that Arctic  
8 Gas would prefer that, to having the National Energy  
9 Board authority only look after construction, and  
10 have the Department of Fisheries look after the fish,  
11 and the Department of the Environment look after air,  
12 water, and birds.

13 A Yes, I think when you  
14 get many authorities involved, really it becomes a  
15 very difficult situation. You know, frankly, the  
16 major area of concern is that I'm not too sure you  
17 could finance the project if you had all those authori-  
18 ties. The people putting up the money, the debt money,  
19 etc, would say, "Well, you know, can you in fact --  
20 what are the costs of this project going to be? You  
21 don't know if you're going to get stopped here. You  
22 don't know where the authority really is, and all of  
23 these things involve cost. Are you going to complete it  
24 on time, etc. etc.?" And I think the concern from  
25 that standpoint just gets greater and greater, the  
26 more authorities you have over the construction of the  
27 pipeline.

28 Q And has Arctic Gas  
29 approached the Federal Government to suggest that this  
30 is the way they would like to see the project policed?





V.L. Horte  
Cross-Exam by Bayly

1 A No, not specifically.

2 Q And is it the intention  
3 of Arctic Gas to do so?

4 A Certainly during the  
5 course of these hearings, as we've said here, and when  
6 we are before the National Energy Board, I am sure  
7 we are going to put forth the same suggestions.

8 Q All right, and would you  
9 envisage Arctic Gas drafting up perhaps a set of  
10 rules with which it felt it could live and submitting  
11 them to the authority, as suggested ways of their  
12 policing the project?

13 A No, I really haven't  
14 contemplated that.

15 Q Say it again.

16 A We really haven't contemp  
17 -lated telling them how to do it.

18 Q All right. I assume in  
19 asking that question that you are in the process now  
20 of setting up your own procedures for internal policing  
21 of the project which are to be realized in the operations  
22 and construction manuals that have been referred to by  
23 the other panels.

24 A Yes sir.

25 Q Now, in discussing the  
26 reports on cross-delta in your cross-examination by  
27 Mr. Templeton, you suggested that these would probably  
28 be ready in the fall and -- but you weren't able to give  
29 a specific date. Now I'm not asking you to give a  
30 specific date today, but I'm wondering, Mr. Commissioner,



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1 if we can get an undertaking from Arctic Gas to let  
2 us know as soon as they do, what month their consult-  
3 ants expect to have their reports in so that, if  
4 necessary, we can gear up whatever personnel we need  
5 in order to assess these prior to the end of these  
6 hearings?

7 MR. GENEST: I thought we'd  
8 given that undertaking, sir.

9 THE COMMISSIONER: Yes, well  
10 at any rate I had indicated I didn't <sup>even</sup> require it be-  
11 cause I knew you'd tell us as soon as you found out.  
12 But you might try, when we come back on June 2nd, to  
13 give us some idea. I think Mr. Horte said the fall or  
14 September or something, but you might, Mr. Genest,  
15 see if you're in a position on June 2nd to tell us  
16 when these reports could be expected. The consultants  
17 might be in a better position to let you know by then.

18 MR. GENEST: We'll do our  
19 very best, sir.

20 MR. BAYLY: Perhaps this would  
21 be an appropriate time to break, sir. I've reached  
22 another one of those natural spots.

23 THE COMMISSIONER: Yes. Well,  
24 I was just reflecting on some of Mr. Horte's answers.  
25 We will adjourn for a few minutes.

26  
27  
28 (PROCEEDINGS ADJOURNED)  
29  
30



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( PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

MR. BAYLY: Q Mr. Horte,  
if we could move to the question of pipe supply which  
has been gone into by the Purcell panel, and I just  
want to go into something that wasn't really clarified,  
and perhaps you as an officer of Arctic Gas can tell  
me this. If we take the possible example that all  
the pipe could come from Canada, we were given by the  
Purcell panel a figure of one year before the pipe  
would start to roll out of the pipe mill, and I in-  
vestigated that and found it was <sup>because</sup> the processes would  
have to be set up and the machinery to manufacture  
the pipe in this size; have you investigated the amount  
of time it would take to get all the pipe that would  
be required for the entire project, if it were to  
come, from say Stelco?

A Well, the Stelco capacity  
for rolling 48-inch pipe in the new Stelformmill is  
approximately 500 miles of pipe per year, or 500,000  
tons of pipe per year. Now that isn't of course the  
complete answer in that you have to have plate  
capacity also to fully utilize that rolling capacity.  
As of the moment, Stelco's own plate capacity for that  
pipe mill, the amount of tonnage that they could  
dedicate to it, based on their present steel productive  
capacity, is, as they see it, in the order of 300,000  
tons, growing to 400,000 tons when they complete the  
additional facility on their new facility on Lake  
Erie.

Q Well, does that mean 300





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1 or 400 miles of pipe?

2 A Yes, roughly, yes.

3 Q So if they were to do  
4 it all they would have to at least get some of the  
5 plate steel from somebody else?

6 A That is correct.

7 Q And given the construction  
8 schedules that have been projected, would it be fair  
9 to say that a single manufacturer like Stelco could  
10 not supply the pipe and still allow you to keep those  
11 schedules?

12 A Yes, I think that is  
13 correct. We can't get all of the 48-inch pipe for the  
14 total project in Canada, as we now see it.

15 Q All right, so some of  
16 the pipe would have to come from other countries and  
17 we went into the fact that some could come from United  
18 States, some from Japan, and some from Italy, some  
19 from Germany.

20 A Yes.

21 Q Now, given the capacities  
22 of the various possible suppliers, can a combination  
23 of them give you the pipe and still keep you on your  
24 construction schedules?

25 A Well, very easily as we see  
26 the circumstances at the present time, for instance  
27 in recent conversation with the Japanese pipe mills,  
28 they have a capacity today of producing well in  
29 excess of a million 200,000 tons of this kind of pipe  
30 in one year.



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Cross-Exam by Bayly

1 Q Would it be fair to say  
2 that if it were decided, that they could supply all  
3 the pipe and still keep you on your construction  
4 schedule?

5 A As of the moment, if we  
6 were ordering pipe today, I would expect that they  
7 could.

8 Q And would you agree with  
9 me that some of the pipe will very likely come from  
10 Japan, given that the Canadian capacity to prepare it  
11 just cannot keep you on your schedule?

12 A I think that's a good  
13 likelihood. Obviously we're going to shop around and  
14 get the best deal possible, and there are a number  
15 of sources, as you mentioned earlier, the Japanese, the  
16 West German situation, the Italian, the U.S., all with  
17 capability.

18 Q All right, and this --  
19 THE COMMISSIONER: Excuse me,  
20 whereabouts in the U.S. -- the Great Lakes? I don't  
21 mean the Great Lakes, but I take it U.S. Steel and  
22 people like that can ship from the Great Lakes to  
23 Welland and then by rail to Hay River; is that a  
24 possibility, or --

25 A I can't tell you the  
26 exact routing. I do know that with respect to 48-inch  
27 diameter pipe, U.S. Steel is going ahead with plans  
28 for a 48- inch pipemill, etc., in Orange, Texas. It  
29 may well be that that would be a water shipment out of  
30 the gulf and around that way.



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Q Through the Panama Canal?

A It may well be.

MR. BAYLY:  
Q Well, given these as

possibilities, Mr. Horte, would you agree with me that this makes the various supply routes other than the Mackenzie River and the railroad to Hay River far more important in terms of Arctic Gas' logistics than it would have been if you'd been able to get all the pipe in Canada?

A That is certainly something under study, but I think what we fundamentally contemplated is that that pipe will come down the Mackenzie.

Q All right now, but the one thing that we were not able to put into the logistics mix when we had Mr. O'Rourke here, was your statement that you contemplated getting pipe from a large number of sources including Japan, therefore we weren't able to say just how likely it was that these other routes might be used. I am assuming this becomes more likely, though not final, given that you contemplate getting some of the pipe anyway from foreign sources.

A Well, subject to more studies, my offhand impression is that most of that pipe, in any event, will end up at Hay River and move down the river.

Q Mr. Horte, you say you have studies under way now. These are studies as well that we would be very anxious to find out about,





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1 because they may have an influence on the delta area,  
2 and its use as a staging area or its communities'  
3 use as a staging area. Have you any idea when these  
4 reports and studies will be completed and available to  
5 this Inquiry?

6 A Well, you really won't  
7 know the source of pipe for sure until the time of  
8 purchase.

9 Q All right, I realize that,  
10 but given possible sources of pipe outside North  
11 America, will your logistics be at least firmed up in  
12 the alternates to a greater extent than they are now?

13 A Yes, I think so.

14 Q In other words, you will  
15 have costed out whether it makes more sense to bring  
16 Japanese pipe through the Bering Straits rather  
17 than by sea to Vancouver and by rail and barge into the  
18 Mackenzie?

19 A Yes, I think on -- at  
20 least the contemplation as I understand it today is  
21 that on the north end of the system, and that is the  
22 Alaska portion in particular, the expectation would be  
23 and it depends upon shipping quotes, etc., that this  
24 would probably be the most convenient way of bringing  
25 certainly Japanese pipe.

26 THE COMMISSIONER: Excuse me.

27 Q What would be the most  
28 convenient way?

29 A Coming around Point  
30 Barrow through the Bering Straits.



V.L. Horte  
Cross-Exam by Bayly

MR. BAYLY: Q Now, Mr. Horte,

as you probably know, the community hearings in the  
delta and Inuit communities of the Arctic Islands  
above the delta, we contemplate, will be in the fall.  
Is it likely that we will have better firmed up  
logistics by that time, so that these people can  
evaluate the impact should one or more of their  
communities be used as a major off-loading area of  
Japanese supplies?



1 Or do you contemplate that?

2 A Yes, I think we would

3 -- we would know more at that time. I don't know  
4 that it would change the staging areas too much  
5 one way or another -- it has got to come off that  
6 river --

7 THE COMMISSIONER: I wonder,  
8 Mr. Genest, if you might look into this. It may  
9 be that I didn't altogether understand Mr. O'Rourke,  
10 but he said he had proceeded on the assumption that  
11 all the pipe would originate within Canada. His  
12 assumption was that. If, given what Mr. Horte  
13 has told us this morning, it is likely that pipe  
14 will originate offshore, whether it is brought to  
15 Vancouver, and then by rail to Hay River, whether  
16 it is brought to Skagway and then to Whitehorse and  
17 over the Dempster,<sup>or</sup> whether it is brought around  
18 Point Barrow, it may be that given those alternatives,  
19 which now take on rather a more tangible form than  
20 they had when Mr. O'Rourke was here, given what you  
21 have said today, Mr. Horte, you might see if you  
22 can comply with Mr. Bayly's request. For instance,  
23 if you were to bring pipe in from Japan around  
24 Point Barrow, you might want to be rather more  
25 specific than you have been so far about where you  
26 would off load it and where it would be taken from  
27 there and so on. I think that Mr. Bayly is  
28 thinking about places like Tuktoyaktuk, would they  
29 be involved in a rather more intensive way so  
30 far as offloading and staging is concerned than we





V.L. Horte  
Cross-Exam by Bayly

1 have so far been told.

2 Now, I am not suggesting  
3 that anyone should rush into the breach this morning  
4 and try to answer that, but I think you might  
5 investigate it, if you wouldn't mind.

6 MR. GENEST: We will  
7 look into that, sir.

8 THE COMMISSIONER: Could  
9 I ask you a question, Mr. Horte, that arises from  
10 what you said earlier. You said that Arctic Gas  
11 was anxious that if it received authority to go  
12 ahead with this project, that there should be one  
13 governmental authority to which Arctic Gas would be  
14 answerable during construction.

15 A Yes.

16 Q You suggested in a  
17 way that might well have caused hearts to race  
18 a little faster in Ottawa, that a number of  
19 government departments should relinquish their  
20 jurisdiction to the National Energy Board in that  
21 connection. One thing you added to that was  
22 that you felt and I -- that it was essential if  
23 you were to be able to raise the money, to borrow  
24 money --

25 A Yes.

26 Q I am not talking  
27 equity, to borrow money to build this pipeline,  
28 it was essential that you should be able to say to  
29 the banks, whoever the people are who lend you the  
30 money, "There is only one authority that we are answerable



1 to, only one authority can shut us down during  
2 construction." Was that the real purport of  
3 what you were saying?

4 A It was, sir.

5 Q Without that you don't  
6 think you can raise the money?

7 A Well, it certainly  
8 becomes, I would think more difficult as you add  
9 other authorities because of the reasoning. It  
10 obviously raises the question of -- the questions  
11 that I suggest, will you be shut down, is there  
12 going to be long periods of time in which the  
13 two authorities are going to have to work things  
14 out, etc., so it raises the risk from the stand-  
15 point of that party putting up the debt money.  
16 And certainly the equity money as well.

17 With respect to the  
18 one authority, we feel strongly about that, maybe  
19 I overemphasized the National Energy Board, I would  
20 like to state that, you know, the essential thing  
21 is that <sup>it</sup> be an authority. It just seemed to me, to  
22 us, logical that the National Energy Board which  
23 already exercises that authority and inspects and  
24 supervises construction on interprovincial pipelines,  
25 would be the logical authority with that background  
26 and expertise to carry out the supervision.  
27 They may have many inputs which they obviously would  
28 from other departments and areas in arriving at  
29 the type of supervision, etc., that would take  
30 place, but it seems to me that they are a very



1 logical one because of their experience, etc., in  
2 this area. It doesn't necessarily have to be  
3 done that way, but I think that the real point is  
4 an authority, not two or three authorities.

5 Q You are saying that  
6 you want one governmental authority charged with  
7 jurisdiction over the construction of this pipeline  
8 and if you are asked to give your own preference,  
9 you say the National Energy Board?

10 A Yes, sir.

11 THE COMMISSIONER: Yes, sorry,  
12 Mr. Bayly.

13 MR. BAYLY:

14 Q Now, before we leave  
15 the question, Mr. Horte of pipe from other sources  
16 than Canada, and without going into the questions  
17 between you and the pipe manufacturers about actual  
18 costs of pipe, are there advantages financially  
19 speaking to buying some of the pipe in places other  
20 than Canada, Japan, for example?

21 A Well, I guess that  
22 remains to be seen when we see the quotes that are  
23 obtained in connection with buying pipe. We will  
24 put it out for bid.

25 Q Would this be a  
26 consideration as to the source of pipe that you  
27 would weigh very carefully.

28 A Certainly price is  
29 a consideration, yes, sir.  
30





V.L. Horte  
Cross-Exam by Bayly

1 Q And just basing it on  
2 what I understand about economics of these things in  
3 very simplistic terms, would you contemplate some  
4 of the suppliers saying, "I will supply it to you  
5 for this price if you will let me supply all of it,  
6 or this much of it"?

7 A Their prices may  
8 be related to the volume, that is not unusual.

9 Q All right, so, until  
10 you get into that stage, you won't be able to say  
11 what proportion of pipe will come from what source?

12 A That is correct. I  
13 think ,you know, that we are fairly safe in saying,  
14 based on what we know today that the Canadian  
15 sources will be competitive and therefore we would  
16 maximize to the maximum extent possible under  
17 those circumstances the Canadian content.

18 Q There is the possibility  
19 though that, say, the Japanese people could give  
20 you such a good deal on all the pipe in one year that  
21 you couldn't refuse it?

22 A I doubt very much that  
23 will be the case.

24 Q But it is a possibility?

25 A Anything is always possible,  
26 I think Somebody gives you an offer you can't  
27 refuse.

28 MR. GENEST: A donation.

29 MR. BAYLY:

30 Q Now, Mr. Horte, at an



V.L. Horte  
Cross-Exam by Bayly

1 earlier stage in the hearings you were presented  
2 by Mr. Genest as the man who could tell us about  
3 solution or source and cap gas and the difference between  
4 them. and I will refer you to this volume 32 of  
5 the transcript, and for Mr. Genest that is XXXII

6 MR. GENEST: Thank you. Or  
7 "gracia."

8 MR. BAYLY:

9 Q Sir, I am referring to  
10 page 4056.

11 A Yes.

12 Q And there is a question  
13 at line two by the Commissioner and I will begin  
14 there.

15 "I think what you are asking is whether the  
16 delay in bringing the Prudhoe Bay gas on --  
17 is owing to the nature of the gas to be  
18 extracted at Prudhoe Bay."

19 And then I responded to the Commissioner's  
20 question:

21 "That is correct, sir, yes."

22 And Mr. Genest responded by saying:

23 "Well, I think I can find that out,  
24 sir. I think Mr. Horte knows this. He  
25 is an expert in that subject."

26 And it transpired that we would ask you.

27 A Yes, sir.

28 Q Were you made aware of  
29 this before coming for this examination?

30 A I was aware of this,



V.L. Horte  
Cross-Exam by Bayly

1 yes.

2 Q All right, now,  
3 rather than my cluttering it up with what I think  
4 solution and cap gas is, perhaps you could tell the  
5 Commission.

6 A The difference between  
7 the solution gas and gas cap gas --

8 Q Yes.

9 A Well, the difference  
10 is that solution gas in an oil field such as the  
11 Prudhoe Bay oilfield is gas that in the reservoir  
12 itself, under the pressure and temperature conditions  
13 of that reservoir is actually in solution with the  
14 oil at those pressures and temperatures.

15 Now, when that oil is  
16 produced and brought to the surface, and therefore  
17 the pressure is reduced and it reaches atmospheric  
18 pressure and atmospheric temperature conditions,  
19 that gas that was in solution with the oil, breaks out,  
20 if you like, or bubbles out of the oil and separates  
21 itself from the oil. The gas so separated is  
22 what we refer to as solution gas.

23 Now, in that same reservoir  
24 there is what we call gas cap gas, and --

25 Q Is that "gap", the  
26 second word, sir?

27 A Gas cap.

28 Q Cap.

29 A In a field such as the  
30 Prudhoe Bay field, maybe you could best visualize





V.L. Horte  
Cross-Exam by Bayly

the field itself as being contained within a dome or structure where the oil and gas is trapped in this structure. It is trapped because below the oil, water traps it in this enclosed structure so that within that structure, or that dome, if you like, at the bottom, starting at the bottom you will have water at a certain elevation or level. Immediately above the water, because it is lighter and that is how it migrated there in the first instance, you have oil and within that oil it contains a solution gas that we have talked about.

Immediately above that oil is, in the upper part of that structure, in this particular instance, is natural gas. It is not mixed nor is it in solution with the oil, it is in its natural state, it is lighter than the oil and therefore has migrated into this situation above the oil. That gas is similar to a situation, the only difference between that, what we call gas cap gas and gas in just a straight gas field is that in a straight gas field you normally have the gas sitting right on top of the water and being trapped in the structure by the water. In this situation you simply have a layer of oil in-between there and then you have the natural gas on top. That is what is called the gas cap gas.



V.L. Horte  
Cross-Exam by Bayly

1 Q Now, you refer to that  
2 as being -- the solution gas, as being the kind that  
3 you have at Prudhoe Bay, and now am I correct in saying  
4 --

5 A We have both kinds.

6 Q You have both kinds, yes.  
7 But there are areas --

8 A Now the makeup of the  
9 gas itself, whether it's in solution or in the gas  
10 cap, is very similar. You know, it's mainly methane,  
11 that's  
12 what natural gas is.

13 Q And the gas that has been  
14 discovered so far in the delta, I understand, is  
15 mainly capped or gas capped gas, is that correct?

16 A No, we just call that  
17 a gas reservoir, it doesn't happen to have oil. It's  
18 only when there is oil associated in that reservoir  
19 that you call the gas that's separate from the oil  
20 "gas cap gas", otherwise you just call it a gas field.

21 Q So that the delta gas  
22 is sitting on water without any oil, the stuff that  
23 has been found so far.

24 A Yes, the majority of it,  
25 although there will be in the Adgo area there is  
26 oil as well. In that well the estimates are that  
27 the gas, or gas that we've calculated for that  
28 reservoir is separated from the oil by an impermeable  
29 barrier or barriers so that it is in another reservoir,  
30 separate from the oil; but if the oil were ever  
produced, if enough oil were found up there to make



V.L. Horte  
Cross-Exam by Bayly

1 the production of oil an economic situation, when that  
2 oil were produced it also contains solution gas, and  
3 that gas would be produced as well.

4 Q All right now, with  
5 regard to the procedures that are involved in the  
6 extraction of oil with solution gas in it, am I correct  
7 in theory that -- or in practice -- that the solution  
8 gas is used to help extract the oil?

9 A The solution gas, the  
10 expansion of that as you release pressure, that  
11 solution gas does help drive the oil out of the  
12 reservoir.

13 Q And is it contemplated --

14 A Or it could be one of  
15 the elements that helps to drive the oil out of the  
16 reservoir, yes.

17 Q All right, is it con-  
18 templated in Prudhoe Bay that the solution gas will be  
19 used to pump the oil out of the reservoir?

20 A No, in the case of the  
21 Prudhoe Bay field, well, if you want to look at the  
22 reservoir mechanics, it depends on the particular field  
23 when you have the situation. If you have what you  
24 call an active aquifer, or the water situation  
25 below, the recovery of oil from a field can be complete-  
26 ly that of an active aquifer, and that is as you  
27 produce the oil the water pushes in and acts as the  
28 driving force to move the oil out. So you can have  
29 a combination, and you can have combinations of these  
30 things. An active water drive, solution gas, etc.,





V.L. Horte  
Cross-Exam by Bayly

1 and the benefit of gas cap gas as well, which can act  
2 as a driving force to produce the oil.

3 Q And would the combination  
4 be used at Prudhoe Bay in order to extract the oil  
5 first of all?

6 A Well, a combination of  
7 all of these things are part and parcel of the produc-  
8 tion of any field.

9 Q Now, will this be reflec-  
10 ted in different startup times for the running of  
11 gas through the pipeline from Prudhoe Bay and the  
12 delta, in other words will the delta start up first?

13 A No, the reason in our  
14 plan for the starting at different times is not related  
15 to that, because in the Prudhoe Bay field, depending  
16 on the time of completion of the Alyeska oil pipeline,  
17 which is estimated in 1977, and some estimates say if  
18 they don't meet that schedule then certainly they will  
19 be completed in '78. That means you will be producing  
20 oil in '77 or '78, from the Prudhoe Bay field. Now  
21 when you produce that oil, that solution gas is pro-  
22 duced with it. Now in the interim until there  
23 is a pipeline outlet , that solution gas will be  
24 reinjected or conserved, reinjected back into the  
25 reservoir. So really you have a situation in the Prudhoe  
26 Bay field in which it will be waiting for a pipeline  
27 outlet in order to market the gas production. In the  
28 interim it will be reinjecting that gas back into the  
29 reservoir, so the timing of connecting to the Prudhoe  
30 Bay field is not associated, as the circumstances now



V.L. Horte  
Cross-Exam by Bayly

1 indicate, with the completion of the pipeline. It  
2 would be ready to produce gas sooner than we will be  
3 there.

4 Q So given that the con-  
5 struction schedule of the gas pipeline is the way it  
6 has been projected, then gas would begin to start from  
7 Prudhoe Bay and the delta at the same time, approxi-  
8 mately.

9 A No, the construction plan  
10 contemplates that we wouldn't hit the Prudhoe Bay area  
11 until one year later.

12 Q All right. Does that  
13 mean that the gas that is being produced in the delta  
14 will be shared among the various consumers that will  
15 end up sharing the gas from Prudhoe Bay as well?

16 A I would doubt that, sir.

17 Q So the gas that came out  
18 of the delta for a year would go to Canadian markets,  
19 and no gas would go to American markets until a year  
20 later.

21 A I would certainly expect  
22 that to be the case.

23 THE COMMISSIONER: The gas  
24 you find in solution with oil at Prudhoe Bay, when you  
25 say "find it in solution", is the gas in its liquid  
26 state or in its gaseous state when it is in solution?

27 A It's in a -- it would  
28 be in a liquid, or it would be absorbed in that. It  
29 would not break out in a gaseous phase until the  
30 pressure was reduced.



V.L. Horte  
Cross-Exam by Bayly

MR. BAYLY: Q If I may go

1 back for a moment to quite another topic, and that is  
2 the use by Arctic Gas of consultants. Now, please tell  
3 me if my view of this is one that you share. Arctic  
4 Gas is made up of people who are experienced in oil  
5 and gas production, the companies that form it have  
6 been in the business for varying lengths of time, but  
7 all of them for quite a long time.

8 A Yes.

9 Q And so that when engin-  
10 eering studies are done, construction studies are done,  
11 these are things that can be appraised by the members  
12 of the consortium from a learned and experienced point  
13 of view.

14 A Yes, I think that's an  
15 accurate statement.

16 Q Now, --

17 A Experiences vary between  
18 companies but --

19 Q Yes, and probably some  
20 of the companies as well have people who have exper-  
21 ience in appraising some of the environmental input  
22 that has come from consultants to Arctic Gas. Is that  
23 fair to say?

24 A That is fair to say.

25 Q And perhaps some of them  
26 even have somebody who can look at the consultants  
27 you've hired, and the socio-economic areas, <sup>if</sup> we can  
28 use that phrase, to appraise what they have done?

29 A I think really, sir,  
30 that to a much lesser extent, in the engineering



V.L. Horte  
Cross-Exam by Bayly

1 and environmental areas, as I indicated in my direct  
2 testimony, we have a number of sub-committees of the  
3 Management Committee with expertise in various areas  
4 that are reviewed, and we have gained a great deal  
5 from the inputs of all this storehouse of knowledge  
6 from the various companies in those two areas. There  
7 is not a similar committee with respect to the sociolo-  
8 gical aspects, and this is something where I would  
9 think that certainly while the Management Committee  
10 and there are inputs from these other sources, it's  
11 not in the same structured form, and has been an area  
12 that certainly to a great extent management's recommen-  
13 dations have been a key factor in this area.

14 Q All right, my concern, Mr.  
15 Horte, is this, that if the consortium is to look at  
16 itself and say, "Are we in a position to evaluate what  
17 our consultants have done?" And you've gone through the  
18 process of why you used various consultants from  
19 different disciplines, they may be better equipped  
20 -- that is Arctic Gas may be better equipped to discern  
21 whether, say, a certain report by an engineer on  
22 construction is a good report or a bad report than  
23 they are able to discern whether a socio-economic  
24 report or an environmental report is a good report  
25 or a bad report.  
26  
27  
28  
29  
30





V.L. Horte  
Cross-Exam by Bayly

1                   A     I don't know how, sir,  
2     to respond to that question. I'm not sure I exactly  
3     get your point. Maybe you could clarify it.

4                   Q     All right. You've  
5     received a large number of reports from many disciplines,  
6     some of which your member companies may be in a position  
7     to say, "That is a good report or not," because they  
8     have this expertise developed through their own  
9     independent work and research on other projects, they  
10    can say, "That's no good," or "That's good," on  
11    construction of pipelines. Trans-Canada has built  
12    them, Union Gas has been involved in them, Gulf and  
13    Shell, etc., have been involved in these things.

14                  A     Yes.

15                  Q     What I want to know is  
16    how do you judge a socio-economic report if you've  
17    never done them before?

18                  A     Well, what we've done,  
19    of course, is try and retain people who can give us  
20    advice in this area from the standpoint of the  
21    Management Committee, I suppose it would be fair to  
22    say that they have placed a great deal of confidence  
23    in the management that they selected for Canadian  
24    Arctic Gas in performing and doing a good job in this  
25    area, with less input of their own, if you like, than  
26    in those other areas. I don't know how else to come  
27    at it.

28                  Q     Would you agree with  
29    me that it's more of a problem in these areas because  
30    you don't have a sort of bank of this kind of infor-  
   mation?



V.L. Horte  
Cross-Exam by Bayly

1 A I think there's probably  
2 less expertise in these areas.

3 Q All right.

4 A That's readily available.

5 Q Going now to the right-  
6 of-way itself as a reason for route selection, now  
7 we've gone over the four phases and the reasons in  
8 those four phases why the prime route was selected.  
9 What I want to suggest to you is that there may be  
10 a couple of other reasons for selecting the prime  
11 route. As I understand, part of the prime route goes  
12 through or close to some fairly valuable coal deposits,  
13 is that true?

14 A Are you thinking of  
15 south-western B.C.?

16 Q That is one of the places,  
17 yes.

18 A That's an area that's  
19 being looked at very carefully to see just exactly  
20 what should be done in that situation.

21 THE COMMISSIONER: Did you  
22 say "South-western B.C."?

23 A South-eastern, I'm sorry.

24 MR. GENEST: Right from  
25 Victoria.

26 MR. BAYLY: Right in your  
27 own back yard, Mr. Commissioner.

28 Q And when you say it's  
29 being looked at very carefully, would you say and would  
30 you agree with me that it's not a bad idea to locate a



V.L. Horte  
Cross-Exam by Bayly

1 facility either near coal deposits or perhaps near  
2 mineral deposits that are likely to be developed and  
3 might likely need gas as a source of power?

4 A Well, if you're talking  
5 about the coal deposit, the problem there is one of  
6 trying to stay away from the coal deposits, on the  
7 grounds that with mining, etc., and a pipeline going  
8 over top of it, is this really the best thing to do?

9 Q So your feeling is that  
10 you'd rather avoid mineral deposits than --

11 A No, I was just particular-  
12 ly talking about this one instance of the coal deposits  
13 in B.C.

14 Q But generally speaking,  
15 would you try to be close to mineral deposits, if at  
16 all possible, envisaging the possible development of  
17 them and the use of gas to power whatever facilities  
18 are used to extract them?

19 A Only in a very general  
20 sense, I would think. It's pretty hard to really  
21 locate a pipeline, knowing, you know, where future  
22 mines, etc, are going to be discovered. I think that's  
23 a minor consideration.

24 Q When you say "a minor  
25 consideration", did it go into the mix in deciding  
26 that the Mackenzie Valley was a good place for a pipeline?

27 A No, I really don't think  
28 it did.

29 Q All right. Now you  
30 were asked some questions yesterday to which Mr. Genest  
objected,





V.L. Horte  
Cross-Exam by Bayly

1 with some reason, some good reason, with regard to  
2 when the end of the --

3 MR. SCOTT: I missed that.

4 MR. BAYLY: I think

5 Mr. Scott was out to coffee, the question involved  
6 your forecast as to when you would get regulatory  
7 approvals. Now, it's been gone into that you just  
8 don't know that, but may I suggest to you that you  
9 have given this Commission some construction schedules,  
10 and would it be fair to say that the company has made  
11 some estimates so that they can say when they want  
12 to start constructing?

13 A Yes, the assumption is  
14 made in those construction schedules that we would  
15 have those schedules as testified to and modified by  
16 Mr. Dau in his testimony. They contemplate approvals  
17 for the project to attain that schedule within the  
18 first quarter or thereabouts of 1976.

19 Q All right. Now,  
20 after -- I assume you don't go out and try and raise  
21 money until after you get approval.

22 A That is correct, you  
23 can't raise money until you have that. You can  
24 only discuss and plan.

25 Q All right, how much of  
26 the money do you have to raise before you can begin,  
27 or do you raise all of it before you begin?

28 A You have to see where  
29 all of it is coming from before you can begin.

30 Q Now --



V.L. Horte  
Cross-Exam by Bayly

1 A You have to know where  
2 all of it is coming from before you can begin.

3 Q When you say you have  
4 to know, if some of it is to come from public subscrip-  
5 tion, I gather the knowledge is a forecast, if you're  
6 going to issue some sort of --

7 A Well, there are various  
8 ways of handling that. I don't know if we're going  
9 to get into the whole financing plan, but there are  
10 ways of handling that through interim bank financing,  
11 and the banks certainly to some extent taking a risk  
12 on your ability to raise the funds that you contemplate  
13 from the public. These are all part and parcel of  
14 financing plans, and you know, I am certainly no  
15 expert in this area and if you want to get into this  
16 area, you know, it's really beyond my capability.

17 Q I don't intend to get  
18 into it in detail, but if I may just try and recap  
19 in my own mind what you have stated, that you want  
20 to know where the money is coming from and you are  
21 nonetheless feeling that you want to be in a position  
22 to start before all of the money is in the bank.

23 A Well, you fundamentally  
24 try and arrange so that the money is committed. It  
25 may be drawn down at various stages, as required.  
26 In other words you don't get the whole bundle and  
27 hold it until you need it. You arrange it on a draw-  
28 down basis, but you have to know where it's coming  
29 from because if you don't, then the people that do  
30 put money in, how do they know in fact that you're



V.L. Horte  
Cross-Exam by Bayly

1 going to complete the project?

2 Q All right, and I assume  
3 that the difficult area is not going to the big  
4 companies, as you suggested, and getting them to  
5 commit certain of their resources or resources that  
6 they are able to borrow, but going to the public itself.  
7 That's where the forecasts come in?

8 A Well, the big amount of  
9 money comes from debt money, and a lot of this is  
10 going to come from private institutions. That's where  
11 the big money comes from. That's the area where the  
12 bulk of the debt money comes from, and that's where  
13 you really have to satisfy them that --

14 THE COMMISSIONER: Well, given  
15 your current estimate that this project will cost  
16 7 billion, as I understood it, only 700 million would  
17 be raised by way of equity capital.

18 A No. In the initial  
19 project, and looking at the Canadian side, the amount  
20 of actual capital that will be required to be raised  
21 in total, in the initial construction will be \$5.6  
22 billion. Thereafter, revenue generated from the  
23 movement of the gas itself will enable us to proceed  
24 with the remainder of the construction that takes  
25 place as the volumes increase from the initial volume,  
26 so the basic financing of the project requires funds  
27 of \$5.6 billion, as we estimated. Of the 5.6, the  
28 plan estimates that we will require by the lenders  
29 that the equity proportion of that be 1 billion 4.

30 Q Oh yes, yes, yes.



V.L. Horte  
Cross-Exam by Bayly

1                                   A     Which would leave the  
2 debt portion, if you like, at 4 billion 2. That's  
3 the external funds or debt money that will have to  
4 be raised. Now, of the 1 billion 4 of equity funds,  
5 what we are saying, we feel that we can raise at least  
6 50% or 700 million of that in Canada. We will cer-  
7 tainly be raising substantial parts of the debt  
8 money as well in Canada.

9                                   Q     So that there's no  
10 misunderstanding, I think Mr. Genest said at the  
11 opening of these hearings that the projected capital  
12 cost of the project was -- I think he said 7 billion,  
13 forgive me, Mr. Genest, if I'm wrong.

14                                  A     That's fully powered,  
15 sir, that's as it builds up from the three or 3 1/4 billion  
16 a day level to the 4 1/2 billion a day level.

17                                  Q     Well, I understand.  
18 Thank you for explaining that.

19                                  A     All right.

20                                  MR. BAYLY: Those are all the  
21 questions I have, Mr. Commissioner.

22                                  Thank you, Mr. Horte.

23                                  MR. SCOTT: Mr. Anthony isn't  
24 here, of course. I'm prepared to fill in for a while,  
25 if that's desirable, to use the time.

26                                  THE COMMISSIONER: I think  
27 perhaps we will run on till 12:30 , that will still  
28 give everyone time to have lunch and get their  
29 aircraft, or their automobiles, or they can proceed  
30 on foot.





V.L. Horte  
Cross-Exam by Scott

1 CROSS-EXAMINATION BY MR. SCOTT:

2 Q Mr. Horte, I with some  
3 reluctance, wish to follow up the questions that Mr.  
4 Bayly asked. The reluctance is dictated by the fact  
5 that I don't understand anything about corporate  
6 financing, which I am just about to demonstrate.

7 A We're in trouble then  
8 because I'm no great expert in that area.

9 Q I take it first of all  
10 that the consortium has in hand adequate financing  
11 in its judgment, from its members to carry it through  
12 to the stage at which it will go to its members,  
13 associates, or the public for equity capital?

14 A You mean adequate  
15 financing for the study phase?

16 Q For the study phase and  
17 the regulatory phase.

18 A No, this is -- we submit  
19 budgets to our Management Committee and those are  
20 approved or have been approved in the past on a quarter-  
21 ly basis. The budget is submitted for the whole year  
22 but only approved on a quarterly basis. In this  
23 particular year, the year 1975, the budgets were  
24 submitted for the whole year, and the commitment by  
25 the members of the Management Committee were made for  
26 the first six months. We will be reviewing with that  
27 Management Committee very shortly the second half  
28 budgets again to obtain their approval.  
29  
30



V.L. Horte  
Cross-Exam by Scott

1 Q Well, I am not  
2 going to suggest that/<sup>if</sup>you have any trouble let us  
3 know or anything like that, but --

4 MR. GENEST: I have  
5 kept CARC's speech.

6 MR. SCOTT:

7 Q But I take it that  
8 the proposition is this, that until regulatory  
9 approvals are obtained, the funds that enable the  
10 consortium to carry on must be provided by the  
11 members on either a quarterly, bi-annual or annual  
12 basis, whatever is regarded as appropriate.

13 A Yes, sir.

14 Q Yes, and you reasonably  
15 anticipate, I hope, that those funds will be made  
16 available to get you through the regulatory phase.

17 A We certainly hope  
18 so.

19 Q But I take it that it  
20 follows from what members of other panels have  
21 said that the funds that are necessary to do the  
22 very expensive final design work, the specification  
23 work and the other detailed and complicated work  
24 before construction commences, are not available  
25 and will not be available until approvals have  
26 been granted and moneys raised in the market.

27 A I think that is a fair  
28 statement, that the major expenditures, the really  
29 big money which starts when you get into that sort  
30 of real implementation, if you like, will not be



V.L. Horte  
Cross-Exam by Scott

1       obtained until approvals are granted.

2                               Q       Yes, and you have made the  
3       point that the approvals are in your judgment necessary  
4       as a precondition to raising funds in the market  
5       so that those who invest will have some sense of  
6       security that the project is at least as far as  
7       government and agencies are concerned, off the  
8       ground and ready to go.

9                               A       Yes,

10                              Q       Yes, and I take it  
11       when we talk about approvals, we are talking  
12       not only about Canadian approvals, but American  
13       approvals?

14                              A       Yes, sir.

15                              Q       And that -- would  
16       it be correct to say that you will not be in a  
17       position to go to the market for unconditional  
18       money until those American approvals are in fact  
19       obtained?

20                              A       You need both  
21       pieces, yes, sir.

22                              Q       And I take it then  
23       that if ~~there~~ should be any delay in the American  
24       approvals you have no Foothills type backup plan  
25       that would permit the commencement of construction  
26       of a line from Canadian sources to Canadian markets?

27                              A       No, sir, we do not.  
28       Nor do we think on the basis of the reserves in the  
29       delta today that there is a feasible plan in fact  
30       that could be implemented now.





V.L. Horte  
Cross-Exam by Scott

1 MR. GIBBS: You should  
2 let Mr. Blair speak to that.

3 MR. SCOTT: Well, Mr. Blair  
4 has already spoken to it in a number of arenas. I  
5 am glad to hear that he will be speaking to it  
6 here.

7 Q Now, I think I understood  
8 the -- I was going to call it a debate -- it is not that,  
9 but the series of questions between you and Mr.  
10 Gibbs in which you discussed the manner in which  
11 the consortium is presently controlled and I think  
12 that it was his position that the voting arrangement  
13 gave one unit a veto and it was your view that the  
14 voting arrangement instead made necessary the estab-  
15 lishment of a consensus. I don't want to get into that,  
16 but I want to ask you this; I take it that those  
17 arrangements for control of the operation will  
18 terminate when the approvals are granted and when  
19 it is necessary to go to the market for funds.

20 A Yes.

21 Q Well, now, you have  
22 told us how much money must be raised by way of  
23 equity capital, and you have indicated in your  
24 evidence in chief some conditional commitments  
25 that you have from Canadian sources. Have you any  
26 conditional commitments from sources outside of  
27 Canada?

28 A No, we are in the  
29 process at the present time of having discussions  
30 with each of the participant companies similar to what



V.L. Horte  
Cross-Exam by Scott

1 we have had on the Canadian side with U.S. participants  
2 to see the extent to which they would be prepared  
3 to conditionally commit themselves with respect  
4 to equity capital .

5 Q Yes, may I put it this  
6 way that one of the objects of your prey when  
7 you are looking for conditional commitments in the  
8 United States will be this mid-northern group of  
9 consumer companies. Have I got the right name, the  
10 Northern --

11 A Northern Border --

12 Q The Northern Border  
13 Group.

14 A Well, the companies  
15 that make Northern Border -- not Northern Border  
16 itself.

17 Q The companies --

18 A Those companies have  
19 formed a company called Northern Border for the  
20 purpose of moving gas to their respective markets on  
21 the U.S. side, that is to the mid-west and eastern part  
22 of the United States. I don't contemplate that  
23 Northern Border itself will be an investor in  
24 Arctic Gas. Instead, we are talking with the  
25 companies that make up Northern Border who happen  
26 to be members of our consortium as well.

27 Q How many of those  
28 are there? You told us their names and I don't want  
29 them. Do you recall how many there are in that  
30 mini consortium?



V.L. Horte  
Cross-Exam by Scott

1 A As I recall, I think  
2 there are six companies in Northern Border.

3 Q Yes. -- And there  
4 interest in obtaining additional sources of gas  
5 is, I take it, sufficiently identical that they  
6 have been led to form a company in fact called,  
7 Mid-Northern.

8 A Northern Border.

9 Q I am sorry, Northern  
10 Border.

11 But the object -- your  
12 source of capital will not come from that consortium  
13 type company, but it is anticipated will come  
14 from the components of it?

15 A Yes,

16 Q Yes, and would it be  
17 fair to say that you would hope to look to them for  
18 a very substantial conditional commitment?

19 A Yes.

20 Q Can you give us any  
21 order of the percentage?

22 A Not really. We are  
23 going to attempt to get just as much as we possibly  
24 can I can see ourselves getting from the Canadian  
25 interests.

26 Q Yes.

27 A The remainder then  
28 will have to be raised from those U.S. interests  
29 of the companies you mentioned and others. There  
30 are the west coast members of the consortium, Pacific



1 Lighting Corporation who has required gas on the  
2 North Slope, the P, G & E system, the Pacific  
3 Gas and Electric system which through Alberta Natural  
4 is represented in our consortium. Then of course  
5 there are the producing companies themselves, both  
6 Canadian and U.S. which may well be a source of  
7 equity capital.

8 Q Well, let me assume  
9 that you --

10 A You see, I can't  
11 really break that all down, we are going through  
12 that process now, sir, trying to --

13 Q Let me --

14 A -- see where it is  
15 all going to come from.

16 Q Let me assume that  
17 you raise 60% of your equity capital in  
18 Canada, I take it that you would look for the  
19 other 40 then you would look substantially in the  
20 direction of that mid-west consumer group for a  
21 large hunk of the balance

22 A Let me say this, that they  
23 make up six companies, right?

24 Q Yes.

25 A In the west coast there  
26 are two companies. All totalled there are four  
27 -- five producing companies in our consortium at  
28 the present time which gives you a total of 13  
29 companies, then really you would be looking to --

30 THE COMMISSIONER: 13 U.S.





V.L. Horte  
Cross-Exam by Scott

1 companies.

2 A Yes, with three of  
3 those, you know, being a mixture of -- with Canadian  
4 interests in them, mainly Imperial Oil, Gulf Canada and  
5 Shell Canada.

6 MR. SCOTT:

7 Q But Mr. Horte, aren't  
8 the consumer companies, the companies that are  
9 most desperate to get this gas ?

10 A They certainly are  
11 very anxious to get this gas, there is no question  
12 about that. I suppose on the other hand the  
13 producers are anxious to market that gas as well.

14 Q Yes, but I take it  
15 that because of the desperation of these mid-west  
16 companies --

17 MR. GENEST: He hasn't agreed  
18 that it's desperation.

19 THE COMMISSIONER: Anxiety.

20 MR. SCOTT: All right,  
21 anxiety.

22 MR. GENEST: Anxiety, that is  
23 right.

24 MR. SCOTT: Because of the  
25 anxiety of these companies in the mid-west , you  
26 would be able to formulate some very effective  
27 arguments inducing them to make substantial commitments  
28 to the equity capital.

29 A I really don't think  
30 we will have to argue a lot. They purchase gas on



V.L. Hotte  
Cross-Exam by Scott

1 the North Slope and they have to find a way of  
2 getting it to market. They obviously as members of  
3 this consortium feel that this is the best way. Now,  
4 from that they have to go to the point of seeing that  
5 the project is constructed or they are not going  
6 to obtain the gas in that manner.

7 Q Yes, well, let me  
8 ask you one other question. How is the -- how is the  
9 control of the company through shares to be related  
10 to those who advance equity capital?

11 A I suppose no differently  
12 than in any other corporation.

13 Q Well, do I understand  
14 from that, for example, that if Canadians buy 60%  
15 of the equity capital of Arctic Gas, they will have  
16 a technical 60% control of the company?

17 A They will form the  
18 majority of the shareholding interests, yes.

19 Q Yes, now you would  
20 be familiar with many cases in industry where effective  
21 control of a company is obtained by the single largest  
22 shareholding even though that be much less than  
23 50%?

24 A Yes.

25 Q Yes, is there any  
26 possibility -- we will put it better than a possibility --  
27 is there any risk in this enterprise that the effective  
28 control of the company will be achieved by the  
29 mid-western consumer companies to which we have  
30 referred?



V.L. Horte  
Cross-Exam by Scott

1                   A     I would very much  
2     doubt that and certainly that is a matter that I  
3     am sure is going to be reviewed at length when the  
4     final financing plan is put together. Certainly  
5     the guidelines require that this be gone into  
6     very thoroughly. I don't think that I could be  
7     of much help at this stage.

8                   Q     But in any event I take  
9     it that the question of final design, specifications,  
10    contracts and so on, all those decisions will be  
11    made by the company substantially after it is  
12    funded and established?

13                  A     Well, I think that  
14    basically all those final designs, etc., will be  
15    -- they will be in full knowledge of those when  
16    in fact the financing is done, so it will be on  
17    the basis of those that they fundamentally will  
18    be putting up their money, so that I will see  
19    it just a continuation if you like from the point  
20    that we are at at that time into implementing  
21    the project,

22                  Q     I am sorry, I misunderstood  
23    then. I understood from the other panels that those  
24    things would not be done and indeed could not for  
25    financial reasons be done until after regulatory  
26    approval and the obtaining of funds .

27                  A     Well, maybe I misunderstood  
28    you, sir. The final detailed design, if you like, that  
29    is true, that would not be available to them at that  
30    point, the whole basic fundamental project, etc., though,





1 it is not a big step to go from that to implementing  
2 a final design. YOu know what you are doing. You  
3 are now just implementing that plan in detail.  
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V.L. Horte  
Cross-Exam by Scott

1 Q Then would this be a  
2 correct analysis of the progress of the operation, that  
3 you are now moving toward final design and while you  
4 will not complete it before funding, you will very  
5 substantially complete it, and that is indeed neces-  
6 sary in order to get funding?

7 A You have to be at a  
8 point sufficiently that in connection with the funding  
9 the people are confident that you sufficiently  
10 planned it, sufficiently designed it, that in effect  
11 it will be built within the estimates that you're  
12 putting forward.

13 Q Yes, so that in truth  
14 the investors want you to be very close to final  
15 design and specification before they are asked to  
16 invest.

17 A Well, you know, it's  
18 a matter of degree.

19 Q What are the degrees?

20 A I can't tell you that  
21 for sure. Let's say in a facility in Southern Canada  
22 I think that we have gone further already in this  
23 connection than would be required than a facility  
24 being built in Southern Canada, in order to raise  
25 money.

26 Q Well, let me ask you  
27 this: How long after regulatory approval and the  
28 obtaining of equity capital do you anticipate the  
29 final design and specification will take?

30 A I think we'll be in



V.L. Horte  
Cross-Exam by Scott

1 sufficient shape at the time of approval that we'll  
2 immediately go to financing.

3 Q Yes, and then how long  
4 after that before final design and specification is  
5 in hand?

6 A Well, final design and  
7 specification, you know, what do you call final? You  
8 continually --

9 Q The letting of contracts.  
10 I take it those things are necessary before the con-  
11 tracts for construction can be let.

12 A Yes, and sometimes you  
13 proceed in phases on the contracting of the thing,  
14 the -- you know, you do the logistical area, you'll  
15 be doing the wharfing area, and all those things,  
16 contracts in that connection prior to the letting of  
17 the actual pipeline/construction contracts, which  
18 comes later. But on each of those steps you will have  
19 to give to the party that will be doing the contract,  
20 sufficient detail that he can make a bid with  
21 respect to the construction of that facility. We --  
22 our plan contemplates, as we've suggested, that if we  
23 have approvals in the early part of 1976, that those  
24 matters can be taken care of and the construction  
25 plan as set forth implemented.

26 Q Well now, let me turn,  
27 as everybody has, to the question of routing, and I  
28 take it from reading Mr. Dau's evidence that it was  
29 the responsibility of his firm, for Arctic Gas, to  
30 draw the route and at least they may have had a further



V.L. Horte  
Cross-Exam by Scott

1 responsibility, to hire and obtain the advice of  
2 environmental consultants.

3 A Yes.

4 Q And I take it also from  
5 Mr. Dau's evidence that his firm with that environmen-  
6 tal advice, made judgments as to routing and costed  
7 them out, and on the basis of that made recommendations  
8 to the Arc<sub>u</sub>tic Gas consortium.

9 A Certainly, and you know,  
10 to describe that process so much of it was done  
11 really in constant consultation, you know, it wasn't  
12 like each day you received a recommendation from  
13 Northern Engineering Services about this, that or the  
14 other thing. There were regular meetings discussing  
15 this matter, and decisions made jointly.

16 Q Yes. Well with respect  
17 to routing and the environmental considerations involved,  
18 Mr. Dau told us, as I recall his evidence, that he  
19 recalled no case in which his firm had made a recommen-  
20 dation to Arctic Gas where the recommendation was  
21 refused. Do you recall any such case?

22 A I can't recall specifi-  
23 cally. That would surprise me, but to the extent that  
24 that is so, I think it's certainly understandable be-  
25 cause the process was one of continual consultation  
26 between our supervising people and the Northern Engineer-  
27 ing Services with respect to these matters, and joint,  
28 if you like, decisions made in review of the, on review-  
29 ing the facts, etc., associated with that, whatever  
30 the particular matter might be. You know, this wasn't





V.L. Horte  
Cross-Exam by Scott

1 a completely formalized approach. There's no way you  
2 can do that and operate effectively with consultants.  
3 You have to be in constant communication.

4 Q Yes. Well now, with  
5 respect to routing and socio-economic factors, Mr.  
6 Dau told us that it was the responsibility of Arctic  
7 Gas to retain -- Arctic Gas rather than N.E.S. -- to  
8 retain or hire the socio-economic consultants.

9 A Yes.

10 Q And I take it that you  
11 retained for that purpose Gemini North, and more  
12 recently, van Ginkel & Associates.

13 A Yes. Maybe some history  
14 on that, the -- at the time of the merger of Gas Arctic  
15 systems and the Northwest Project Study Group, many  
16 of the consultants used by those two groups were  
17 continued to be used by the new single group. In the  
18 case of Gemini North, Gemini North had been consultants  
19 to Gas Arctic Systems for some period of time, and  
20 that association was continued with the new group.

21 Q When did van Ginkel come  
22 into the picture, do you remember that?

23 A I think sometime in 1974,  
24 last spring of 1974.

25 Q Well, we'll be hearing  
26 from them no doubt later.

27 A Yes.

28 Q Now, to deal with the  
29 process that has been dealt with by several other  
30 people, I'd ask you to turn to page 15 of this



V.L. Horte  
Cross-Exam by Scott

1 biblical text on which you've been relying from the  
2 beginning --

3 A Yes sir.

4 Q -- and to look at --

5 MR. GENEST: I wish you'd  
6 avoid these editorial remarks.

7 MR. SCOTT: Well, it's not  
8 intended to be --

9 MR. GENEST: I don't think  
10 it gets us anywhere.

11 MR. SCOTT: It's not intended  
12 to be offensive. I simply observe --

13 MR. GENEST: Well, it is.

14 MR. SCOTT: Apparently. I  
15 simply observe that I think it's rather unfair to  
16 all the witnesses in the sense that we treat these  
17 -- the canned evidence as if it's holy writ in some  
18 fashion.

19 Q But Mr. Horte, looking  
20 at the paragraph --

21 THE COMMISSIONER: 15 minutes  
22 to go.

23 (LAUGHTER)

24 MR. SCOTT: I can shorten that  
25 up.

26 Q Looking at the paragraph  
27 that begins with the word "Therefore," let me read it  
28 because if I understand it, that paragraph almost  
29 by itself sets out your understanding of what was  
30 at stake.



V.L. Horte  
Cross-Exam by Scott

1 "Therefore it was our judgment that the engineer-  
2 ing and environmental considerations had to take  
3 paramount position in the basic route selection  
4 design and construction planning activities.  
5 Once the plans were drawn, they were subjected  
6 to socio-economic scrutiny with the object of  
7 identifying the potential socio-economic  
8 consequences of the location of pipeline  
9 facilities, and of giving us the opportunity  
10 of assessing whether there were adverse  
11 effects which could be avoided."

12 Now, is that in a nutshell the process that you have  
13 attempted to describe?

14 A Yes it is.

15 Q And I take it that what  
16 happened was that when the line was drawn, you asked  
17 the consultants, Gemini North and van Ginkel to scru-  
18 tinize it.

19 A Gemini North at that  
20 point in time, yes sir; and I think there was some  
21 input from the Environmental Protection Board, who had  
22 members who also looked at this area.

23 Q And I take it that  
24 it was their function, having scrutinized it, to  
25 identify as you put it, the potential consequences of  
26 location.

27 A Yes.

28 Q And their reports in due  
29 course will speak to the problems that they identified.

30 A Yes sir.





V.L. Horte  
Cross-Exam by Scott

1 Q And then thirdly, they  
2 were to give Arctic Gas the opportunity of assessing  
3 whether there were adverse effects which could be  
4 avoided.

5 A Yes.

6 Q Now, did you ask the  
7 consultants if in their judgment there were any adverse  
8 effects that could be avoided by route location? Is  
9 that what happened?

10 A Well, the effect was that  
11 they were presented with the plan, the routing, and  
12 the opportunity to study that plan, and then as has  
13 been referred to many times in the course of this  
14 hearing, the overall meeting to consider all of these  
15 aspects was held so that all of those inputs could  
16 be considered, not only those but the environmental and  
17 engineering inputs as well, so that on the basis of  
18 those we could make a judgment decision.  
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1 Q Well, what I am really  
2 asking and perhaps I express it in too complicated  
3 a fashion, but was Gemini North invited to make  
4 suggestions as to route changes as a result of your  
5 work?

6 A Yes, I would say that.

7 Q No, would you --

8 A That was the purpose  
9 of their being at the meeting.

10 Q Now, do you recall whether  
11 they suggested any route changes?

12 A I don't specifically.  
13 I think the minutes of those meetings would be the  
14 best source for that material.

15 Q Well, now, I take  
16 it from what you have said this morning that whatever  
17 the facts had been, there were no route changes that  
18 were made purely as a result of socio-economic  
19 considerations?

20 A I don't know whether  
21 you would classify the Travaillant Lake change,  
22 it seems to me it is a mixture of socio-economic  
23 and environmental factors. The two in many areas  
24 can be very closely related, one to the other.

25 Q Apart from that are  
26 you aware of any route changes that were made for  
27 socio-economic reasons?

28 A No, I -- and I may well  
29 be wrong. I don't know of any.

30 Q Well, would it be correct



V.L. Horte  
Cross-Exam by Scott

1 to say that the reason none would probably be requested  
2 and no such route changes would be made, would  
3 be because of the fundamental philosophy that is  
4 shown on page 14 of your evidence where you say that  
5 "in our view"-- and I am reding from the fourth  
6 paragraph, 'The development of a pipeline in the  
7 mackenzie Valley region is of substantially more  
8 consequence than the specific mile by mile routing  
9 of the pipeline."

10 A Yes, I think that is  
11 a major factor.

12 Q And would it then be  
13 fair to say that you with your advisors having  
14 come to that fundamental conclusion about socio-  
15 economics, didn't see specific route changes as  
16 likely to alter the socio-economic impact of the  
17 pipeline in any appreciable way.

18 A Yes.

19 Q Well, I'd ask you to  
20 look at your application to the department, I don't  
21 know the exhibit number but it is the white covered  
22 volume, paragraph 22 --

23 THE COMMISSIONER: What  
24 page?

25 MR. SCOTT: Page 14, and  
26 I am quite conscious before beginning, Mr. Horte,  
27 that in the nature of things you may not be  
28 personally responsible for every word that appears  
29 in this document --

30 A Please don't put me in



V.L. Horte  
Cross-Exam by Scott

1 that position.

2 Q Paragraph 22 reads,

3 "The selection by the applicant of  
4 the route of its pipeline was made  
5 to insure the minimal environmental  
6 impact on and the greatest socio-  
7 economic benefit to the regions of  
8 the Northwest Territories and the  
9 Yukon Territory concerned."

10 Well, dealing with socio-economics, leaving out  
11 environment, how does that square with the process  
12 that in fact occurred, or is that just some lawyer's  
13 extravagant language?

14 A Well, I would have  
15 to say to a great extent it is extravagant language,  
16 however, you know, it seems to me that certainly  
17 routing of the pipeline on the east side of the  
18 Mackenzie itself is of a major socio-economic benefit  
19 to communities on that side <sup>where</sup> most of the communities  
20 are located.

21 Q Well now, dealing with  
22 the placement of the route adjacent to communities  
23 I would like you to turn, if your counsel can help you,  
24 to Mr. Dau's evidence, volume 18, page 2150.

25 A Yes, I have it sir.

26 Q I would just like  
27 to read a couple of questions and get your judgment  
28 about whether in your view this is an accurate  
29 statement of what was at stake. We were talking  
30 about the placement of the line in relation to





V.L. Horte  
Cross-Exam by Scott

1 communities along the route, beginning at line  
2 five:

3 Question:

4 " A sociologist might be able to fix  
5 in sociological terms the distance a  
6 pipeline and its social impact should  
7 be from a community, 'you understand the  
8 theory?"

9 "Yes, I understand."

10 "You didn't have any of that input?"

11 "No, sir."

12 "And therefore I put it to you that  
13 your recommendations to Arctic Gas on  
14 the appropriate distance from communities  
15 was dictated by the problems of pipeline  
16 construction and economics exclusively."

17 Answer:

18 "I think the answer to that is yes, but  
19 I must tell you that in no instances  
20 was the pipeline logically located so  
21 close to the communities that we would  
22 have to consider the redesign of  
23 the wall thickness. The logical location  
24 that we have, you know, that we were  
25 not conscious of that particular thing  
26 because it didn't occur."

27 "Your main consideration in this area  
28 was economic and engineering?"

29 "Yes, sir."

30 "Entirely?"



V.L. Horte  
Cross-Exam by Scott

1 "Yes, sir."

2 "And it will be a happy accident that  
3 the sociologists will agree with  
4 your placement of the pipe in relation  
5 to communities?"

6 "I imagine that is true, sir, yes."

7 Now, would that, in fairness, be -- you having  
8 formed your major judgment about the impact of  
9 the line itself, would that in fairness be  
10 what routing was all about in terms of its  
11 placement in relation to communities?

12 A I think that is in  
13 fairness to the original routing of the thing.  
14 As we have already discussed it was then subjected  
15 to the scrutiny of those looking at the socio-economic  
16 aspects of it. As it turned out as a result of  
17 those meetings, there were not significant changes  
18 as I have just finished discussing a few minutes  
19 ago, that resulted from that, so I wouldn't  
20 say that socio-economic considerations didn't  
21 go into the ultimate selection of it. The original  
22 selection was made on basis primarily and after  
23 review of the socio-economic changes, or socio-  
24 economic factors, it was not varied to any great  
25 extent.

26 Q Would it be correct  
27 to say in your words that it was scrutinized by  
28 the socio-economists and no substantial changes  
29 were made?

30 A Yes.



V.L. Horte  
Cross-Exam by Scott

1 Q Well now, I take it that  
2 as a result of all that, the company's position is  
3 set out on page 15 and perhaps you could turn to  
4 page 15 of your evidence --

5 A Yes.

6 Q The bottom of the first  
7 paragraph, you have been discussing the difficulty  
8 of measuring and quantifying sodo- economic considerations  
9 and the extent to which they will vary in personal  
10 judgments.  
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V.L. Horte  
Cross-Exam by Scott

Q Then in the last sentence  
you say:

"Further, many of the socio-economic considerations with respect to the maximization of benefits or the minimization of detrimental effects are best dealt with through the formulation of appropriate company policies, which will be discussed in Phase 4."

And I take it that would it be fair to say then, that the pipeline being in place on a map, it's the judgment of the company that the way to respond to any socio-economic problems that occur is primarily through company policies.

A I think in the particular instance of, let's take the case of a particular community, the impact of the project in sociological terms in the shorter term, you know, there is the longer term socio-economic impact to all communities in the north because of developments in the north which we think is a major longer term consideration. In the shorter term, obviously the construction activity is the area that must be looked at in particular, in our opinion, and must be handled very carefully, and will be handled very carefully pursuant to company policies associated with how we go about that construction and how we relate to those communities, and this is a subject that will be discussed at length in Phase 4. That's the intention of that statement.

Q Well now, is this



V.L. Horte  
CRoss-Exam by Scott

1 process<sup>of</sup> designing company policies to minimize or  
2 maximize these conditions under way?

3 A Yes.

4 Q And who's in c harge of  
5 that exercise, leave aside construction techniques  
6 and design techniques for a moment, who's in charge  
7 of that exercise of designing appropriate policies?

8 A The CAGSL staff, along  
9 with the consultants that we use in this area.

10 Q Well, we've heard from  
11 the construction people, but is there any -- is there  
12 at this stage any manual or guideline or list of the  
13 policies that have been developed and to which you  
14 refer here?

15 A I can't think of any  
16 specific manual or list at this point in time, sir.

17 MR.GEN EST: Well, Mr. Scott,  
18 some of these that are described in the application  
19 materials are training programs, hiring practices,  
20 management of construction crews.

21 MR. SCOTT: My concern, Mr. --

22 MR. GENEST: Some filings,  
23 I understand, in connection with business opportunities  
24 in the north.

25 MR. SCOTT: My concern, Mr.  
26 Commissioner, is not with anything that is set out in  
27 the application, of course, but if the company is in  
28 the course of developing policies in this area, I'd  
29 be grateful, as perhaps the other participants would,  
30 to have them even in rough form before we come to Phase



V.L. Horte  
Cross-Exam by Scott

1 4 so that they can be examined and evaluated, if there  
2 are such things.

3 Q Mr. Horte, has the  
4 company given its staff any guidelines as to the  
5 areas in which these policies should be developed,  
6 or the considerations that should be at play or at  
7 stake in developing them?

8 A Well certainly we have  
9 many discussions at our Internal Management Meetings  
10 where subjects such as this are discussed, and the  
11 general policies and areas that should be looked  
12 into, studies that should be undertaken. We rely ob-  
13 viously to a great extent on our experts in this  
14 area to give us input and recommendations in connection  
15 with what those things should be. In the final  
16 analysis we have to decide and make those decisions.  
17 It's that sort of a process.

18 Q But I take it that  
19 those decisions as to policies are not as yet in  
20 final form?

21 A Well, I think, as Mr.  
22 Genest has just mentioned, that you know, many of them  
23 are reflected in the application itself. Maybe they  
24 haven't been chronologically in one place, set down  
25 1, 2, 3, 4, but certainly our application has attempted  
26 to deal with , not only in this area but in other  
27 areas, what our basic plan is in this connection.

28 THE COMMISSIONER: Well, is  
29 that a convenient place to stop, Mr. Scott?

30 MR. SCOTT: Yes.



V.L. Horte  
Cross-Exam by Scott

1 THE COMMISSIONER: Before we  
2 adjourn, Mr. Horte, could I ask you this.

3 Q You said that the con-  
4 struction plan now is based on getting approvals from  
5 the regulatory bodies here in Canada and in the United  
6 States in early 1976.

7 A Yes, it is.

8 Q Now, we were advised by  
9 Mr. Dau that the construction plan has already been  
10 postponed by two years from the date in the filings  
11 that were sent to the Federal Government in March last  
12 year.

13 A Yes.

14 Q Well, what I don't under-  
15 stand is if the construction plan has now been postponed  
16 two years and is based on obtaining approval in early  
17 '76, then was the original construction plan based on  
18 getting approvals in early '74 when you only made  
19 your application in 1974?

20 A I think it's a combination  
21 of things, sir. I think that during the intervening  
22 period two things become obvious:

23 (1) Approvals wouldn't be obtained as soon as  
24 anticipated, and

25 (2) That in the construction planning itself, in that  
26 more detailed planning, further lead times were  
27 required than were originally anticipated.

28 THE COMMISSIONER: Well, we  
29 will adjourn the Inquiry until Wednesday, May 28th,  
30 at 1:30 P.M. at Hay River, and we will adjourn the





V.L. Horte  
Cross-Exam by Scott

1 formal hearings until Monday, June 2nd, at one  
2 o'clock here at the Explorer Hotel in Yellowknife.

3 (PROCEEDINGS ADJOURNED TO JUNE 2, 1975)  
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Vol. 45

Canada. National

Energy Board.

Mackenzie Valley pipeline inquiry:

TITLE

Vol. 45

24 May 1975.

DATE DUE

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AUG 15 1975

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Mr. Hottel

Mr. J. J. Hottel

J. J. Hottel

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Government  
Publications

## MACKENZIE VALLEY PIPELINE INQUIRY

IN THE MATTER OF AN APPLICATION BY CANADIAN ARCTIC  
GAS PIPELINE LIMITED FOR A RIGHT-OF-WAY THAT MIGHT  
BE GRANTED ACROSS CROWN LANDS WITHIN THE YUKON  
TERRITORY AND THE NORTHWEST TERRITORIES FOR THE  
PURPOSE OF THE PROPOSED MACKENZIE VALLEY PIPELINE

and

IN THE MATTER OF THE SOCIAL, ENVIRONMENTAL AND  
ECONOMIC IMPACT REGIONALLY OF THE CONSTRUCTION,  
OPERATION AND SUBSEQUENT ABANDONMENT OF THE ABOVE  
PROPOSED PIPELINE

(Before the Honourable Mr. Justice Berger, Commissioner)

Yellowknife, N.W.T.

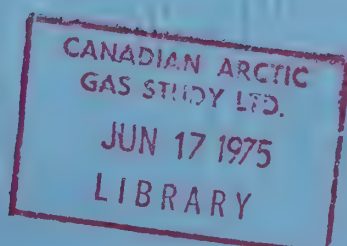
June 12, 1975.

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PROCEEDINGS AT INQUIRY

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Volume 46









APPEARANCES:

Mr. Ian G. Scott, Q.C.	
Mr. Stephen T. Goudge,	
Mr. Alick Ryder and	
Mr. Ian Roland	for Mackenzie Valley Pipeline Inquiry;
Mr. Pierre Genest, Q.C.	
Mr. Jack Marshall,	
Mr. Darryl Carter, and	
Mr. John Steeves	for Canadian Arctic Gas Pipeline Limited;
Mr. Reginald Gibbs, Q.C.	
Mr. Alan Hollingworth	for Foothills Pipelines Ltd.;
Mr. Russell Anthony,	
Prof. Alastair Lucas	for Canadian Arctic Resources Committee;
Mr. Glen W. Bell and	
Mr. Gerry Sutton	for Northwest Territories Indian Brotherhood and Metis Association of the Northwest Territories;
Mr. John U. Bayly	for Inuit Tapirisat of Canada and the Committee for Original Peoples' Entitlement;
Mr. Ron Veale and	
Mr. Allen Lueck	for Yukon Native Brother- hood;
Mr. Carson H. Templeton	for Environment Protect- ion Board;
Mr. David Reesor	for Northwest Territories Association of Muni- cipalities
Mr. Murray Sigler	for Northwest Territories Chamber of Commerce

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WITNESSES FOR ENVIRONMENT PROTECTION BOARD:

Carson H. TEMPLETON  
K. ADAM  
L.C. BLISS,  
N.J. WILIMOVSKY,  
D.W. CRAIK,  
Ian McTAGGART-COWAN,  
E. GOURDEAU  
- In Chief

5996

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136	Report on Terrain & Vegetation - Yukon Coastal Plain & Mackenzie Delta	6029
137	Interim Report No. 3 on Environmental Impact Assessment, March 1973	6030
138	Interim Report No. 2, Environmental Implications, June 1972	6030
139	Interim Report No. 1, Environmental Impact Assessment, November 1971	6030
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1 Yellowknife, N.W.T.

2 June 2, 1975.

3 (PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

4 MR. GOUDGE:Mr. Commissioner,  
5 if we could begin, we would like to commence this week,  
6 if we may, with the evidence of the Environment  
7 Protection Board, at least their evidence in chief as  
8 it is offered through Mr. Templeton and his panel.  
9 This is perhaps slightly out of order, but we've dis-  
10 cussed it among counsel and subject to anything you  
11 might say, sir, we would all be content that it be  
12 done in this way and that their evidence be offered  
13 in chief for the first three days of this week, and  
14 that if any parties later want them recalled for cross-  
15 examination, Mr. Templeton and his group are content  
16 that that be done at some mutually convenient time  
17 when it seems to fit in with the general pattern of  
18 the evidence.

19 As you know, sir, Mr.  
20 Templeton has been ably representing the Environment  
21 Protection Board so far. He's on the panel today, and  
22 to assist him I thought it might be expedient if I  
23 simply assisted by qualifying him and his co-panelists.

24 Perhaps, Miss Hutchinson, if  
25 they could be sworn I could do that then.

26 Thank you. I should say,  
27 Mr. Commissioner, just for the record that of course  
28 the Environment Protection Board is a major partici-  
29 pant in this Inquiry and has been from the beginning,  
30 and are offering their evidence on their own behalf.



Templeton, Adam, Bliss, Craik  
Wilimovsky, McTaggart-Cowan,  
Gourdeau  
In Chief

CARSON H. TEMPLETON,  
K. ADAM,  
L.C. BLISS  
N.J. WILIMOVSKY,  
D.W. CRAIK,  
IAN MCTAGGART-COWAN,  
E. GOURDEAU, sworn:

DIRECT EXAMINATION BY MR. GOUDGE:

Q Mr. Templeton, could I  
begin with you, sir? You received a Bachelor of  
Science in 1943 from the University of Alberta, I  
take it, is that correct?

A Yes.

Q You are a registered  
professional engineer in the Provinces of Alberta,  
British Columbia, and Manitoba?

A Yes.

Q And you're the presi-  
dent presently of Templeton Engineering.

A Yes.

Q Could you tell us, sir,  
how long you've held that position?

A Since 1955.

Q And what has your work  
consisted of in that role?

A We've participated in  
the engineering of a number of northern projects,  
particularly in permafrost affected areas. These  
included several thousand transmission lines, transmis-  
sion line towers for the Manitoba Hydro and also  
microwave towers for the Manitoba Telephone System  
including some 2,000 footings in permafrost-affected





Templeton, Adam, Bliss,  
Wilimovsky, McTaggart-Cowan,  
Craig, Gourdeau  
In Chief

soils. We also conduct engineering on a continuing basis for the Manitoba Public Utilities Board in approving plans for all gas pipelines in Manitoba, conducting rate base and rate of return studies, and performing spot checks of gas installations throughout the province, including the northern communities where there are gas distribution systems in permafrost-affected soils.

Q Sir, in 1956 did you participate in organizing an emergency flood-fighting organization for the Greater Winnipeg area?

A Yes.

Q And what was your role in that connection?

A I was the director of this organization to meet a flood threat, and duties included organizing all of the construction and engineering abilities of the province to meet the flood threat, in which we prepared a contingency plan for flood-fighting which is still in use in Manitoba.

Q I take it you and your firm have also conducted engineering studies for the Royal Commission on Flood Cost-Benefit for Manitoba that was conducted in 1958?

A That's right.

Q And the Geotechnical Division of your firm has developed other mathematical models and so on to assist in the analysis of permafrost regression?



Templeton, Adam, Bliss.  
Wilimovsky, McTaggart-Cowan,  
Craik, Gourdeau  
In Chief

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A Yes.

Q Would you describe that  
for us, please?

A First, we developed a  
single dimensional model to try to evaluate how  
permafrost regresses due to a number of factors, and  
subsequently it gradually evolved into a two-dimen-  
sional model and we have been calibrating this over  
a number of years in the Mackenzie Valley and along  
the Hudson Bay Railroad, the transmission lines, dikes,  
in Manitoba that are in permafrost, etc.

Q Has your geotechnical  
personnel engaged in field work in the Mackenzie  
area?

A Yes, the geotechnical  
personnel have drilled some samples and tested some  
350 holes on the east side of the Mackenzie River  
between Fort Simpson and Norman Wells, and in the  
Peel Plateau and in the Old Crow area.

Q And I take it, sir,  
that you've represented the Manitoba Public Utilities  
Board on the Canadian Standards Association Committee  
on Gas Pipeline Codes Z-184 since the inception of  
that Committee in 1963 and through to 1973. Is that  
correct?

A That's correct.

Q Are you still a member  
of the Committee?

A No, I'm not now.



Templeton, Adam, Bliss,  
Wilimovsky, McTaggart-Cowan,  
Craig, Gourdeau  
In Chief

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Q Are you a member of any  
other related Committee?

A I'm a member of the  
C.S.A. Committee on Pipeline Materials, Z-245.

Q And since 1971 have you  
been a member of the Canada-U.S.S.R. Working Committee  
on Architecture, Building Materials & Construction?

A Yes.





1 Q And what did you do  
2 before forming your own consulting engineering  
3 company?

4 A I worked in a number  
5 of areas but the ones that might be of interest  
6 to this Commission are -- was as a party chief  
7 at Norman Wells on the CANOL pipeline project and  
8 also on the Alaska Highway, the Yukon section. I  
9 was also a district manager for a large contractor  
10 in British Columbia.

11 Q And have you played any  
12 role in organizing the health sciences co-ordinating  
13 council in Winnipeg?

14 A Yes, I was instrumental  
15 in organizing this and it involved bringing together  
16 the efforts of two teaching hospitals, one general  
17 hospital, one research institute, and two university  
18 faculties which involved interaction with three  
19 levels of government.

20 Q And could you describe ,  
21 sir, finally, your role in the Environment Protection  
22 Board?

23 A Well, I was instrumental  
24 in organizing the Environment Protection Board some  
25 four years ago, going on five years, and perhaps  
26 I could just describe that a little more in  
27 more detail later.

28 Q By all means, sir. If  
29 I could move then to Dr. Bliss, you are, sir, I take  
30 it, a professor of botany and director of the Faculty



Templeton, Adam, Bliss 6001  
Wilimovsky, Craik  
McTaggart-Cowan, Gourdeau  
In Chief

1 of Sciences, controlled environmental facility at  
2 the University of Alberta in Edmonton?

3 WITNESS BLISS:

4 A That is correct.

5 Q Yes, and could  
6 you give the Commissioner, please, your educational  
7 background, sir?

8 A I received my B.Sc.  
9 degree from Kent State University as well as my Masters  
10 degree from the same university and my PhD from Duke  
11 University, 1956.

12 Q And what did you do prior  
13 to coming to the University of Alberta in 1968?

14 A I taught for one year at  
15 Bowling Green State University in Ohio and for eleven  
16 years at the University of Illinois.

17 Q And what fields did you  
18 teach in? '

19 A Botany and plant ecology.

20 Q And you have done your  
21 PhD research in a comparative study of Arctic tundra  
22 ecology in Northern Alaska and Alpine tundra  
23 in Wyoming, is that correct?

24 A That is correct.

25 Q Yes, and have you  
26 engaged in certain ecological studies over the last  
27 23 years relative to the north?

28 A that is right.

29 Q Describe them for us,  
30 please.



Templeton, Adam, Bliss 6002  
Wilimovsky, Craik  
McTaggart-Cowan, Gourdeau  
IN Chief

1 A It ranges from studies  
2 in Alpine areas in the New England Mountains, of the  
3 Rocky Mountains, the Rocky Mountains of Wyoming,  
4 the Olympic Mountains of Washington State, a year  
5 in New Zealand studying Alpine vegetation there and  
6 more recently for the last five years, worked both  
7 on both plant ecology in the Mackenzie Delta region  
8 as well as in the Arctic Islands.

9 Q And you served, I take it  
10 from 1959 to 1962 as associate editor of Ecological  
11 Monographs and from 1970 to 1975 as associate editor  
12 of a publication that I will let you pronounce

13 A Oecologia, that is correct.

14 Q What does that mean?

15 A Ecology. It is the  
16 European way of saying it, another way of pronouncing  
17 it.

18 Q I see, and you have been  
19 a member of the NRC, a technical sub-committee on  
20 pipelines from 1970 to 1972?

21 A Yes.

22 Q HAVE you served on any other  
23 NRC. bodies?

24 A Yes, on the grant selection  
25 committee for three years.

26 Q In the environmetal  
27 biological area?

28 A That is right.

29 Q Yes, and you are currently  
30 a member of the Biological Sciences Committee for



1 the World Book Encyclopedia?

2 A that is right.

3 Q And of the Museums of  
4 Canada consultative committee?

5 A That's right.

6 Q And have you been a member  
7 of the U.S. National Committee for the International  
8 Biological Program from 1966 to 1968?

9 A Yes.

10 Q And for the past five years  
11 the director of Canadian Arctic Tundra I.P.B. ecosystems  
12 study on Devon Island?

13 A Yes.

14 Q Have you engaged in any  
15 other co-ordinations of tasks of that kind?

16 A Yes, in the sense of  
17 Co-ordinating the applied and basic research that we  
18 have done in the Mackenzie Delta of back in relation  
19 to gas exploration and the potentiality of gas  
20 or oil pipelines.

21 Q Have you served in the  
22 past as consultants to any oil companies?

23 A Yes, to Elf Oil, to Gulf,  
24 and in a limited capacity to PanArctic.

25 Q And in what connection?

26 A These were environmental  
27 surveys of their field operations.

28 Q And your involvement, sir  
29 with the Environment Protection Board?

30 A As a plant ecologist





Templeton, Adam, Bliss  
Wilimovsky, Caik  
McTaggart-Cowan, Gourdeau  
In Chief

1 helping to guide and direct the plant ecological  
2 research and evaluate work that had been.

3 Q Since its inception?

4 A Since -- about six months  
5 after its inception.

6 Q That would be 1971?

7 A Yes.

8 Q Yes, and you are a Fellow  
9 of the Arctic Institute of North America and the  
10 American Association for the Advancement of  
11 science?

12 A Yes.

13 Q And a member of the Canadian  
14 Botanical Association, the Ecological Society of  
15 America and certain other conservation groups?

16 A That's right.

17 Q And in your field ,  
18 sir, have you engaged in the publication of certain  
19 articles and learned works?

20 A Yes.

21 Q Thank you, Dr. Bliss,  
22 moving then, if I may, Mr. Commissioner, to Dr.  
23 McTaggart-Cowan, you are, sir, presently a professor  
24 of zoology and dean of the Faculty of Graduate Studies at  
25 the University of British Columbia, is that correct?

26 WITNESS MCTAGGART-COWAN:

27 A That is correct.

28 Q And could you give the  
29 Commissioner your educational background, please,  
30 sir.



Templeton, Adam, Blis  
Wilimovsky, Craik  
McTaggart-Cowan, Gourdeau  
In Chief

1 A I have a Bachelor of  
2 Arts degree from the University of British Columbia  
3 followed by a PhD in zoology from the University of  
4 California at Berkeley.

5 Q And you served, I think, sir  
6 from 1935 to 1940 as the Assistant biologist and then  
7 assistant director of the British Columbia Provincial  
8 Museum?



Templeton, Adam, Bliss,  
Wilimovsky, Craik, Gourdeau,  
McTaggart-Cowan  
In Chief

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A That is right.

Q And what were your  
tasks in that connection?

A Mostly establishing  
the technical collections and undertaking ecological  
research.

Q And you joined the  
faculty of the University of British Columbia in 1940,  
is that correct?

A I did, yes.

Q And you've been there  
ever since?

A Been there ever since.

Q You've served some time,  
I take it, on sabbaticals from that university at the  
University of Edinburgh.

A Yes.

Q Anywhere else?

A And I had a sabbatical  
year in New Zealand and Australia, where I was under-  
taking research and teaching, largely ecological  
research in Australia.

Q And then I take it in  
1945 you became a full professor of zoology at that  
university, and in 1953, professor and head of the  
Department of Zoology, is that correct?

A Right, yes.

Q And then in 1959 you





Templeton, Adam, Bliss,  
Wilimovsky, Craik, Gourdeau  
McTaggart-Cowan  
In C hief

1  
2 assumed duties as assistant dean of the faculty of  
3 Arts & Sciences; in 1963, assistant dean of the faculty  
4 of Science; and in 1964, dean of the faculty of grad-  
5 uate studies. Is that so?

6 A That is right.

7 Q Have you maintained your  
8 teaching duties in the Department of Zoology through-  
9 out that period?

10 A Yes, I have, largely  
11 in the graduate sector.

12 Q And I take it throughout  
13 this period of time you've engaged in certain research  
14 interests which you can describe to the Commissioner,  
15 please.

16 A Yes, I have undertaken  
17 research largely in alpine and Arctic/sub-Arctic  
18 environments, quite largely devoted to guiding the  
19 work and participating in the work of my graduate  
20 students who have now numbered 85. This work has been  
21 devoted in very large measure to the ecology of large  
22 mammals and large birds. It has been undertaken in  
23 the Mackenzie Delta, in the Athabasca Delta, in McKin-  
24 ley Park, Alaska, in the Ice Fields Ranges area in  
25 the Yukon, in parts of Southern Africa, and to a lesser  
26 degree in other parts of the world.

27 Q I take it, sir, from  
28 1943 to 1947 you served as a consultant to the  
29 National Parks Service of Canada, and to the Department  
30 of Northern Affairs.



Templeton, Adam, Bliss,  
Wilimovsky, Craik, Gourdeau  
McTaggart-Cowan  
In Chief

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30

A That is right.

Q And has that led to  
certain works engaged in under your direction?

A Since that time I have  
maintained a continuing interest in ecological affairs  
and the management of wild animal resources in Northern  
Canada, and in the Rocky Mountain National Parks area,  
and have continuing research programs going there to  
this very day.

Q I take it, sir, you've  
served as a scientific advisor to the Game Commission  
of the Province of British Columbia for some 15 years  
as well.

A That's right.

Q And in 1949 you commen-  
ced service as a member, and one-time president of the  
British Columbia Resource Conference.

A Yes.

Q What is that body, sir?

A Well, that's a body that  
has since then passed out of existence, but for many  
years it was a group which brought together members of  
the business community, the government, and the acad-  
emic communities that were concerned with the best  
possible management techniques to be applied to the  
natural resources of the Province of British Columbia.  
It met annually, conducted a large series of inte-  
grated studies, and published a series of annual  
volumes.



Templeton, Adam, Bliss,  
Wilimovsky, Craik, Gourdeau  
McTaggart-Cowan  
In Chief'

1  
2 Q I take it from 1955 to  
3 1962 you were a member of the National Research Council  
4 of Canada.

5 A Yes.

6 Q And from 1954 to 1966  
7 a member of the Fisheries Research Board of Canada.

8 A That's right.

9 Q Have you as well served  
10 on committees of this kind relating to the United  
11 States?

12 A Yes, I served as special  
13 advisor to the Secretary of the Interior of the United  
14 States in developing management philosophies for wild-  
15 life refuges and national parks there, and the last  
16 year served as special -- as chairman of a Special  
17 Committee to try and resolve the desperate problems  
18 of grizzly bear problems and management in national  
19 parks.

20 Q And did you undertake a  
21 study of conservation of Australian waterfowl for  
22 Federal and State Authorities there in 1970?

23 A I did.

24 Q And you're at present,  
25 I take it, a member of the Arctic Environment Council.

26 A Yes.

27 Q And what are you doing  
28 in that connection?

29 A That is a group of  
30 citizens, mostly Americans, and two Canadians, that is



Templeton, Adam, Bliss,  
Wilimovsky, Craik, Gourdeau  
McTaggart-Cowan  
In Chief'

1  
2 monitoring in a small way the -- what actually happens  
3 during the development of the Alyeska Pipeline.

4 Q And you're as well a  
5 member of the Canadian Environment Advisory Council?

6 A I'm its chairman, sir.

7 Q And how long have you  
8 held that position?

9 A I've been a member since  
10 its inception three years ago. I've been its chairman  
11 for a month.

12 Q And you're also a member  
13 of the Arctic Land Use Research Committee.

14 A Yes.

15 Q What body does that  
16 committee report to?

17 A Department of Indian &  
18 Northern Affairs.

19 Q You're as well, sir, a  
20 member of the Executive Board of the International  
21 Union for the Conservation of Nature?

22 A Yes, I'm a vice-president.

23 Q And a member and first-  
24 president of the Biological Council of Canada?

25 A Yes.

26 Q And a fellow and former  
27 president of the Arctic Institute of North America?

28 A Yes.

29 Q And as well, a fellow  
30 of the American Wildlife Society and the American





Templeton, Adam, Bliss,  
Wilimovsky, Craik, Gourdeau  
McTaggart-Cowan  
In Chief

Association for the Advancement of Science.

A yes. You can skip the  
next name.

Q I can't pronounce the  
next name. It goes something like the American Orno-  
thologists Union, of which you're a member.

A You go to the head of  
the class.

Q And as well you're a  
member of the American Society of Mammalogists.

A That's right.

Q And president of the  
Pacific Science Association, and a member of the  
Canadian Nature Federation.

A Yes.

Q Finally, a member of  
the National & Provincial Parks Association.

A That's right.

Q Yes, thanks, sir.

Mr. Craik, if I could move  
to you, please. You, sir, are presently a member of  
the Manitoba Legislature?

WITNESS CRAIK: That's correct,  
sir.

Q A member of Her Majesty's  
Official Opposition in that province.

A That's right.

Q And chairman of the  
Caucus Committee on Economic Affairs.



Templeton, Adam, Bliss,  
Wilimovsky, Craik, Gourdeau,  
McTaggart-Cowan  
In Chief

A Yes.

Q In that connection what  
do your responsibilities consist of?



Templeton, Adam, Bliss  
Wilimovsky, Craik,  
McTaggart-Cowan, Gourdeau  
In Chief

1 A Well, it is mentioned  
2 here, sir, not as the -- not necessarily as the priority  
3 item on qualifications for E.P.B. work, but to indicate  
4 here that in this role that if we have to deal with  
5 all the matters that come before the Manitoba  
6 Legislature on Energy and natural resources.

7 Q I take it, sir that  
8 you have served as a minister in the Government  
9 of that province in the past?

10 A I was Minister of Mines and  
11 Natural Resources and also following that Minister  
12 of Education.

13 Q That was during the 1967 to  
14 1969 period?

15 A That is right, sir,  
16 yes.

17 Q And you as well have  
18 been involved in the work of the Environment Protection  
19 Board?

20 A In 1970 I became involved in  
21 interdisciplinary work and as has been mentioned by  
22 Mr. Templeton here, the formation of the Environment  
23 Protection Board took place in 1970, I was involved  
24 in this along with the able guidance of my former  
25 Deputy Minister of Mines and Natural Resources, Mr.  
26 Bill Mere, Winston Mere who was also the former  
27 director of the Canadian Wildlife Service.

28 Q So your educational  
29 background begins with a mechanical engineering  
30 degree, specializing in heat transfer?





Templeton, Adam, Bliss 6014  
Wilimovsky, Craik  
McTaggart-Cowan, Gourdeau  
In Chief

1 A That's right.

2 Q And that was received from  
3 the University of Manitoba in 1956?

4 A That is right .

5 Q And you received your  
6 Masters Degree in Mechanical Engineering from the  
7 University of Minnesota in 1961, is that correct,  
8 sir?

9 A That's right.

10 Q And are you a consulting  
11 engineer with your own practice in Winnipeg?

12 A Yes, sir.

13 Q And I take it as well  
14 during your professional career you have held the post of  
15 Associate Professor at the University of Manitoba  
16 and Executive Director of the Manitoba research  
17 council?

18 A Yes, I was at the  
19 University of Manitoba from 1957 to '64 on a full-  
20 time basis and from 1964 to '66 I was director  
21 of the Manitoba Research Council and during that  
22 period also continued on parttime at the University  
23 of Manitoba.

24 Q Yes, during that period  
25 of time, sir and otherwise, have you engaged in  
26 technical work related to the North?

27 A Yes, basically my  
28 technical work in general was in the area of heat  
29 transfer and solar energy and the number of projects  
30 related to natural resource utilization, but my



Templeton, Adam, Bliss  
Wilimovsky, Craik  
McTaggart-Cowan, Gourdeau  
In Chief

1 involvement in the work in the north was primarily  
2 involved for a matter of several years in the 1960's  
3 in work on artificial, artificially frozen permafrost  
4 structures, also -- I have also referred to the  
5 fact that the work in the North being Northern  
6 Manitoba, was wide ranging in the area of utilization  
7 of Northern Resources and also in education for Northern  
8 peoples.

9 Q Thank you, sir. If  
10 I could turn next to Dr. Wilimovsky, please.

11 Your educational background,  
12 Dr. Wilimovsky, please?

13 WITNESS WILIMOVSKY:

14 A I received my BSc  
15 and MA degrees from the University of Michigan  
16 majoring in the biological sciences. After  
17 working as an associate ichthyologist in the fishery  
18 survey of Brazil, I studied at Stanford University where  
19 I received my Phd in 1955 based on Arctic hydrobiological  
20 investigations.

21 Q And after that, sir, did you  
22 join the research division of the U.S. Fish and  
23 Wildlife Service in Alaska?

24 A Yes, I served as  
25 chief of Marine Fishery investigations there for  
26 four years.

27 Q From 1956 to 1960?

28 A Right.

29 Q And in 1960 you became a  
30 member of the Faculty at the University of British



Templeton, Adam, Bliss  
Wilimovsky, Craik  
McTaggart-Cowan, Gourdeau  
In Chief

1 Columbia?

2 A Correct.

3 Q And you were there  
4 through 1966?

5 A I was director  
6 of the Institute of Fisheries.

7 Q Yes.

8 A During that period I  
9 conducted studies throughout Arctic Alaska, Canada,  
10 the Aleutian Islands.

11 Q In 1967 I take it, you  
12 took a leave of absence to engage in certain research  
13 south of the border?

14 A Yes, I served as senior  
15 staff member for the U.S. President's Council on  
16 marine resources and engineering, in the fisheries and  
17 aquatic areas.

18 Q How long were you in  
19 that position?

20 A For a year. In 1968 I  
21 returned to the University of British Columbia where I  
22 am still presently a Professor of Faculty Graduate  
23 Studies, and the Institute of Resource Ecology, and  
24 curator of fishes for the University of British Columbia.

25 Q And I take it in the past  
26 you have served as a member of the U.S. Atomic Energy  
27 Commission's Committee on Project Chariot?

28 A Yes, I was responsible and  
29 co-editor for the volumes on that activity.

30 Q What is Project Chariot?



Templeton, Adam, Bliss  
Wilimovsky, Craik  
McTaggart-Cowan, Gourdeau  
In Chief

1 A Project Chariot was a  
2 proposal to construct an artificial harbour in North-  
3 west Alaska, near Point Hope. This was the initial  
4 attempt at predicting environmental effects of a  
5 major project and developing mitigated procedures.  
6 I also participated in the biological studies of  
7 Project Long Shot at Amchitka.

8 Q Could you tell us  
9 what that is, please, sir?

10 A This was one of the  
11 first seismological experiments in using a high  
12 yield fishing weapon at great depths, one whose  
13 purposes was to determine the internal structure of  
14 the globe.

15 Q And I take it as  
16 well as those tasks, sir, you have served in the  
17 position of president of the Alaska division of the  
18 American Association of the Advancement of Science?

19 A That is correct, and  
20 I am still a Fellow of the parent organization.

21 Q Which is what, sir?

22 A The triple A, S,  
23 the American Association for the Advancement of  
24 Science.

25 Q And you are a Fellow and  
26 past governor of the Arctic Institute of North America?

27 A Yes, sir.

28 Q And I take it that you  
29 have served as a consultant for a variety of operations,  
30 is that correct?





1 A Yes, I have served  
2 on task forces evaluating fishery research programs  
3 throughout the world. I have been a representative  
4 of the natural academy of sciences in evaluation of  
5 far eastern fishery and oceanographic programs in  
6 Japan, Korea, Taiwan and other southeastern Asian  
7 countries.

8 Q HAVE you undertaken any  
9 functions in connection with the construction of  
10 the Alaskan -- the Trans Alaskan pipeline?

11 A Like Dean Cowan,  
12 I am an elected representative of a panel monitoring  
13 the construction of the Alaska pipeline.

14 Q And you have chaired,  
15 I take it, a U.S. Government panel representative  
16 of industry, conservation groups and the Government  
17 on the tuna-porpoise interaction problem?

18 A Yes, sir.

19 Q I am curious enough to ask  
20 you what that is.

21 A Modern methods of fishing  
22 tuna use purse-seines and in the process of fishing  
23 for yellow fin tuna only, they catch a great number of  
24 porpoise. These are not used as food in North America,  
25 though in other parts of the world they are, there is  
26 a great controversy between segments of the environmentally  
27 oriented community and the fishing industry and it can be  
28 described as a serious controversy and we are trying to  
29 resolve it.

30 Q Could you describe briefly



Templeton, Adam, Bliss  
Wilimovsky, Craik,  
McTaggart-Cowan, 'Gourdeau  
In Chief

1 for the Commissioner, sir, some of your research  
2 related to other aspects of fishery?

3 A My researches have included  
4 work in the area of systematic ichthyology, fisheries,  
5 the ecology of ice, under water instrumentation. My  
6 current interests are chiefly involved with the  
7 development of science policy, systems planning, com-  
8 puter implementation of such work and technological  
9 forecasting in the resource area.

10 Q And I take it in that  
11 connection, sir, you have published a large number of  
12 learned works and professional journals?

13 A I have published over  
14 70 papers in review journals and directed 17 graduate  
15 theses in the aquatic sciences area.  
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Templeton, Adam, Bliss,  
Wilimovsky, Craik, Gourdeau,  
McTaggart-Cowan  
In Chief

Q Now, sir, if I could  
move now to Mr. Gourdeau, please. Mr. Gourdeau, would  
you be good enough to give us your educational back-  
ground?

WITNESS GOURDEAU: I obtained  
a Baccalaureate in Applied Sciences from Laval Univer-  
sity in 1949, and two years later I graduated as a  
forestry engineer. Then I undertook another series  
of studies and in 1953 I obtained a Baccalaureate in  
Social Sciences, and two years later got my degree  
as an economist.

Q And following -- well from  
1950 to 1954, while you were engaged in your studies,  
I take it you engaged yourself as chief instructor of  
the Province of Quebec 4-H Clubs.

A That is right.

Q And from the period 1955  
to 1961 you directed your own forestry enterprise  
and consulting firm in the Province of Quebec.

A Yes sir.

Q And in 1961 did you  
join the Quebec Government as a technical advisor to  
the Minister of Hydraulic Resources?

A Yes, I did.

Q And thereafter you were  
appointed assistant director-general of planning of  
the Ministry of Natural Resources in that government.

A That's right.

Q And what was your role,





Templeton, Adam, Bliss,  
Wilimovsky, Craik, Gourdeau,  
McTaggart-Cowan  
In Chief

1  
2 sir, in that function?

3 A Well, the role was -- the  
4 first role probably was to make some research and study  
5 about important resource issue in Quebec, like the  
6 nationalization of electricity, and steel industry and  
7 things like that, but among these studies, the most  
8 important one maybe was, which is pertinent to what we  
9 are doing here, was a study that I had to conduct for  
10 the government in the year 1961, regarding what should  
11 the Government of Quebec do in the northern parts of  
12 its territory, the part that is called New Quebec,  
13 what's called New Quebec in 1912, when part of the  
14 Ruperts Land became attached to the old Quebec Province.  
15 So I made the study for one year and then I had some  
16 recommendations to the government, and later the govern-  
17 ment decided to do something about it, and to create  
18 a special branch within the government that would have  
19 overall authority in provincial matters, except in  
20 justice and forests, overall authority at the exclusion  
21 of all the other departments in that half of the  
22 Territory of Quebec inhabited by Indian and Eskimo .  
23 So it is from that time really that I got interested  
24 in the economic and human development of the north.

25 Q I take it, sir, in 1963  
26 you became the head of the general directorship of  
27 New Quebec.

28 A I did.

29 Q And what is that  
30 organization, sir?



Templeton, Adam, Bliss,  
Wilimovsky, Craik, Gourdeau,  
McTaggart-Cowan  
In Chief

1  
2 A Well, this is the  
3 organization I just referred to. It was a very  
4 special organization set up to assume all the  
5 responsibilities, provincial responsibilities in the  
6 north of Quebec, including education, health, economic  
7 development, all matters that pertain to the people  
8 or to the economy.

9 Q How long were you in  
10 that position?

11 A I was there until 1968,  
12 and then I became the technical co-ordinator of  
13 an International Conference on Cross-Cultural Education  
14 in the north, sponsored by the University of Alaska and  
15 the Arctic Institute of North America.

16 Q And that lasted for  
17 two years, approximately?

18 A About two years, with the  
19 preparation, the conference itself, and the proceedings.

20 Q Yes, and what did you do  
21 then, sir?

22 A After that I remained  
23 with the Arctic Institute of North America for three  
24 years, where I conducted research on community  
25 development in the north, which gave me the occasion  
26 to become more deeply involved in that part of the  
27 Northwest Territories, because most of our applied  
28 research as well as theoretical research was done  
29 in this part of the country.

30 Q And did that research



Templeton, Adam, Bliss,  
Wilimovsky, Craik, Gourdeau,  
McTaggart-Cowan  
In Chief

1  
2 result in any publications?

3 A It was a research on  
4 community development in the north, and the topics of  
5 our research were identified by the native people in  
6 1970, and the research that we did, the results were  
7 all published in brochures that were circulated to the  
8 people. The most interesting thing, I think, is that  
9 we proceeded through task forces and each task force  
10 comprised an equal number of native people, and other  
11 experts on the subjects studied.

12 Q And what, Sir,  
13 has been your involvement with the Environment  
14 Protection Board?

15 A Well, I will have been  
16 a member of the Board next August for the last three  
17 years now, and I joined the Board after it started  
18 its work, but since then I have taken part in all the  
19 research and discussion of the Board, not as a spec-  
20 ialist, I think, but as a forest engineer and  
21 economist, participating in the general discussions.

22 Q And at the same time,  
23 sir, I take it that you've been a guest lecturer at  
24 Laval and Sir George Williams University?

25 A Yes.

26 Q And have you been doing  
27 consulting work on the north as well?

28 A Oh yes. I am still  
29 doing consulting work and the main work I'm doing is  
30 related to the north.



Templeton, Adam, Bliss,  
Wilimovsky, Craik, Gourdeau  
McTaggart-Cowan  
In Chief

1  
2 Q And are you, sir, an  
3 affiliate member of the Committee of Original Peoples'  
4 Entitlement?

5 A Yes, I am.

6 Q And a member of the  
7 Canadian Political Science Association, the Canadian  
8 Economics Association, and the Quebec Order of Forestry  
9 Engineers?

10 A Yes sir.

11 Q And finally, a member of  
12 the Canadian Arctic Resources Committee and a member of  
13 the fellow of the Arctic and fellow the Arctic Institute  
14 of North America.

15 A Yes.

16 Q Finally, Dr. Adam, if I  
17 may, please, Dr. Adam, could you give the Commissioner  
18 your educational background, please, sir?

19 WITNESS ADAM: Yes. I received  
20 my B. Sc. in Civil Engineering in 1961 from the Univer-  
21 sity of Manitoba, and then in M. Sc. in 1963 from that  
22 same university; and in 1967 I obtained my Ph. D. at  
23 the University -- excuse me, at Colorado State Univer-  
24 sity.

25 Q And I take it, sir, you're  
26 presently an associate professor of civil engineering  
27 at the University of Manitoba?

28 A That is correct.

29 Q And what are your areas  
30 of specialization there?





Templeton, Adam, Bliss,  
Wilimovsky, Craik, Gourdeau,  
McTaggart-Cowan  
In Chief

1  
2 A They include the area  
3 of flow-through porous media and irrigation and drain-  
4 age.

5 Q I take it, sir, you're  
6 a registered professional engineer in the Province of  
7 Manitoba.

8 A That's correct.

9 Q Could you tell the  
10 Commissioner, please, what your involvement has been  
11 with the Environment Protection Board? I take it  
12 to begin with you are not a formal member of the Board.

13 A That's correct, I am not  
14 a member of the Board, but my work with the Board has  
15 included studies and research on the environmental  
16 effects of winter roads for pipeline construction in  
17 northern regions, and participation in inter-disciplinary  
18 aspects of the study, and also various writing  
19 assignments in connection with Board work.

20 Q Thank You, Dr. Adam.

21 Mr. Commissioner, there are  
22 two additional members of the Board who were not able  
23 to be present today, since they, Mr. Templeton  
24 advises me, were as are the other gentlemen on the pan-  
25 el with the exception of Dr. Adam, full members of  
26 the Board, and participated in its work, he suggests,  
27 and I submit, sir, that it might be useful if their  
28 qualifications were outlined briefly to you by way of  
29 Mr. Templeton's telling you what their backgrounds  
30 have been. Mr. Templeton, would you be good enough



Templeton, Adam, Bliss  
Wilimovsky, Craik, Gourdeau  
McTaggart-Cowan  
In Chief

to do that, please?

WITNESS TEMPLETON: One member of the Board was Dr. Stanley S. Thomson. He is unfortunately unable to be with us today because he had a prior commitment in England. He is a professor of civil engineering at the University of Alberta, and received his Bachelor of Science degree in civil engineering at the University of Toronto in 1950, his Master of Science degree, specializing in soil mechanics, at the University of Alberta in 1955, and his Ph. D. in soil mechanics at the University of Alberta in 1963, and Bachelor of Science in geology at the University of Alberta in 1971. He has conducted a sabbatical study leave at the U.S. Army Cold Regions Research & Engineering Laboratory in Hanover, New Hampshire, from June 1971 to '72.

From 1951 to 1954, Dr. Thomson was a technical staff officer at Army Headquarters in Ottawa, where he was responsible for planning, directing research programs in the general areas of equipment and construction application to the Royal Canadian Corps of Engineers. 1954 to '59 he was soils engineer for the 1221-mile Canadian portion of the Alaska Highway, responsible for the advice and design of all matters relating to soil mechanics.



Templeton, Adam, Bliss  
Wilimovsky, Craik,  
McTaggart-Cowan, Gourdeau  
In Chief

1 From 1959 to '61, he was  
2 a sessional instrutor and in September '61 he was  
3 made a fulltime -- put on the fulltime staff of the  
4 University of Alberta, Civil Engineering Department and  
5 the past six years he's conducted occasionally for  
6 local consulting firms, provincial government bodies  
7 and other individuals. He is a member of the  
8 following organizations: the Association of Professional  
9 Engineers, Geologists and Geophysicists of Alberta,  
10 the Association of Professional Engineers of the  
11 Yukon, the American Society of Civil Engineers, the  
12 Association of Engineering Geologists, the Geotechnical  
13 Society of Edmonton, the Alberta Society of Petroleum  
14 Geologists, and the Canadian Association of University  
15 Teachers, and the Engineering Institute of Canada.

16 Dr. Britton was also a  
17 member of the Board. He is a renowned ecologist  
18 known all over the world, unfortunately Dr. Britton  
19 resigned from the Board following the completion of  
20 our environmental impact assessment in September 1974,  
21 so that he could accept a full time position with the  
22 U.S. Geological Survey. Dr. Britton received his  
23 Master of Science Degree from Ohio State University and  
24 he obtained his PhD from Northwestern University in  
25 1941, from 1937 to '55 he was an instructor and  
26 assistant professor and <sup>then</sup> associate professor in the  
27 Botany Department of Northwestern University, and  
28 from 1955 to 1970 he was scientific officer and head  
29 of the Arctic Program of the Earth Sciences Division  
30 of the Office of Naval Research in Washington, and





Templeton, Adam, Bliss  
Wilimovsky, Craik,  
McTaggart-Cowan, Gourdeau  
In Chief

1 from 1970 to 1974 he was director of the Arctic Develop-  
2 ment and Environmental Program of the Arctic Institute  
3 of North America.

4 For most of his  
5 academic career Dr. Britton has specialized in  
6 terrestrial ecology and from 1946 to '49 he studied  
7 the vegetation of peat bogs in the State of  
8 Michigan , and in 1952 he initiated research in  
9 Alaska tundra ecology in the Naval Arctic Research  
10 laboratory at Barrow. He was instrumental in  
11 selecting most of the committee members and served  
12 on the environmental committee for Project Chariot  
13 that Dr. Wilimovsky mentioned, the Committee  
14 appointed by the U.S. Atomic Energy Commission.

15 Dr. Britton is a Fellow of  
16 the American Association for the Advancement of Science  
17 and the Arctic Institute of North America, and a  
18 member of the American Geographical Society, the  
19 American geophysical Union, the American Institute  
20 of biological sciences, the American Polar Society, the  
21 American Society of limnology and Oceanography,  
22 the Antarctic Society, the Botanical Society of  
23 America, the Ecological Society of America, the  
24 National Wildlife Federation, the Scott Polar  
25 Institute, the Society of Sigma X: , Wilderness  
26 Society and the Friends of the Earth.

27 Q Thank you, Mr.  
28 Templeton. Would you be good enough now to proceed  
29 with the evidence that your Board wishes to put  
30 before the Commissioner, please.



Templeton, Adam, Bliss  
Wilimovsky, Craik,  
McTaggart-Cowan, Gourdeau  
In Chief

1  
2 A Mr. Commissioner, I  
3 think to save time, perhaps I could submit as  
4 exhibits -- or submit our reports to be included and  
5 perhaps save a little time as we go along. I wonder  
6 if I could submit our final report in four volumes  
7 entitled "Environmental Impact Assessment of the  
8 Portion of the Mackenzie Gas Pipeline from Alaska  
9 to Alberta", Volume I, "The Board's Opinion", volume II,  
10 "Towards an Environmental Code," Volume III, "The  
11 Environmental Atlas", and volume IV, "Research  
12 Reports.

13 (FINAL REPORT OF THE ENVIRONMENT PROTECTION BOARD  
14 MARKED AS EXHIBIT 135)

15 A I would like also to  
16 submit a report which has been prepared since our  
17 final report on -- entitled, "Terrain and  
18 Vegetation Response to Disturbances in the Yukon  
19 Coastal Plain and the Mackenzie Delta Region and  
20 Relevance to the Proposed Gas Pipeline", dated March  
21 '75 by G.T.S. How and Helios Hernandez.

22 (SUBSEQUENT REPORT BY G.T.S HOW AND HELIOS HERNANDEZ  
23 MARKED EXHIBIT 136)

24 A I would like to also submit  
25 Interim Report number III, "Towards an Environmental  
26 Impact Assessment of the portion of the Mackenzie  
27 Gas Pipeline from Alaska to Alberta", dated March 1973,  
28 appendix one, including appendix I, "Wildlife" -- we  
29 have not submitted Appendix II because it was fish  
30 data. It is available if anybody wants to use it, it  
has been published, but I don't think that it contributes



1 too much to the hearing ; number III is "Ornithology",  
2 Appendix IV is "Geotechnical and Hydrological studies  
3 of Off Right-of-Way Effects", and that has a  
4 map supplement with it. Appendix V, "Revegetation";  
5 Appendix VI, "Winter Road Study"; There is an  
6 additional bibliography and abstracts to the last one,  
7 Appendix VI on the winter road study, of -- a general  
8 bibliography of all the public information that  
9 we could find on winter roads. Appendix number  
10 VII, "Fire and Northern Ecosystems"

11 (INTERIM REPORT NO. 3 AND APPENDICES I, III, IV, V, VI,  
12 VII, DATED MARCH 1973, MARKED AS EXHIBIT 137)

13 A I would like also  
14 to submit Interim Report No. 2, "Environmental  
15 Implications of the Engineering Design of a Gas  
16 Pipeline from Prudhoe Bay, Alaska, to Alberta",  
17 dated June, 1972.

18 (INTERIM REPORT NO. 2, DATED JUNE 1972 MARKED AS  
19 EXHIBIT 138)

20 A I would like to submit  
21 Interim Report No. 1, "Towards an Environmental Impact  
22 Assessment of a Gas Pipeline from Prudhoe Bay,  
23 to Alberta  
24 Alaska", dated November 1971. Appendix I, "Wildlife";  
25 Appendix III, "Vegetation"; Appendix IV, "Revegetation."  
26 (INTERIM REPORT NO.1, DATED NOVEMBER 1972 MARKED AS  
27 EXHIBIT NO. 139)

28 A Appendix II again was  
29 fish data which we are not submitting.-- BUT is available  
30 if anybody wishes it.

Mr. Commissioner, before we



1 begin our presentation today, the Board would like  
2 to thank you and the Commission and also the  
3 participants for allowing us to appear at this time.  
4 We realize that it has inconvenienced many of you  
5 and I certainly appreciate your cooperation. Our  
6 reason for being so insistant about making an  
7 appearance early in the hearing process is that  
8 we wanted to show the connection between control  
9 of the project and our prediction of impacts. Unless  
10 it is understood that impact predictions are tied to  
11 specific project controls, then these predictions may be  
12 well become just generlizations.

13 I was very pleased to hear you  
14 say, Mr. COMmissioner, on May 23rd, that the  
15 participants must outline the terms and conditions  
16 that they urge be imposed if the application is  
17 approved and this be made in draft form after each  
18 phase.

19 By making this ruling you force  
20 us all to be specific.  
21  
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Templeton, Adam, Bliss  
Willimovsky, Craik, Gourdeau  
McTaggart-Cowan  
In Chief

1  
2 It is only human nature,  
3 I think, to put off making decisions until you're  
4 forced to do so, and you forced us to make up our  
5 minds and our recommendations right after Phase 1.

6 To begin the Board's  
7 presentation, I would like to outline what we intend  
8 to discuss in these three days. My purpose in doing  
9 this is to provide you with a table of contents, so  
10 to speak, of what we're going to cover in the hopes  
11 that this will make it easier for you to follow our  
12 presentation.

13 First, we will discuss the  
14 Environmental Protection Board, and I will be telling  
15 you briefly about the concept of an environment  
16 protection board as a means of achieving environment  
17 protection on a large project such as we are discussing  
18 and then we'll discuss the Board's relationship to  
19 the sponsor, Canadian Arctic Gas Study Limited, what  
20 our terms of reference were, then something of our  
21 annual budgets. We will discuss the research work  
22 the Board has done or caused to be done, and the other  
23 work that we have done in an attempt to build in  
24 environmental protection measures into the project.

25 During our presentation we  
26 will summarize our environmental impact assessment of the  
27 project and to do this we will draw your attention  
28 to various components of the project, and of the  
29 environment, and then point out potential areas of  
30 conflict that exist between the two, and discuss



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In Chief

1  
2 recommendations to reduce or eliminate the conflicts.

3 We will supplement our pre-  
4 sentation with slides of maps to illustrate our  
5 methods of arriving at an environmental impact to  
6 show how we formed opinions on whether the project  
7 was environmentally acceptable to us, and outline the  
8 level of performance required by the applicant and  
9 the government to achieve environment protection.

10 Next we will talk about what  
11 we consider is the most crucial issue of this Inquiry,  
12 the environmental control of the project. We will show  
13 why we regard the matter of effective control as an  
14 important issue, and why we believe that the role of  
15 government in controlling the project is a most  
16 significant factor in determining whether the project  
17 if it goes ahead can be built with a limited and pre-  
18 determined amount of environmental change.

19 We will discuss the regula-  
20 tory frameworks of government and the applicant, show  
21 why we believe these are presently inadequate to con-  
22 trol impacts of the project, and we will submit our  
23 recommendations on the roles that must be played by  
24 the government, the applicant, and even the public in  
25 regulating the project, if environmental change is  
26 to be held to what we consider an acceptable level.

27 We will briefly describe an  
28 environmental code which we have prepared specifically  
29 for this project, and show how this code or a similar  
30 one should be administered by a regulatory agency to



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1  
2 control the project. The magnitude and timing of the  
3 effort required to establish adequate regulation of  
4 the project are matters of great concern to the Board,  
5 since again they relate to project control.

6 We will attempt to demonstrate  
7 why it is essential that the government set up a  
8 regulatory agency immediately so that an environmental  
9 code for the project can be enforced.

10 Finally, we will wind up by  
11 summarizing the recommendations evolving from the three  
12 days of our testimony, and the conclusion to which we  
13 came.

14 I think at the outset I  
15 should spend a few minutes to explain the concept of  
16 the Environment Protection Board. The Board evolved  
17 from a request from Mr. Robert Blair, president of  
18 Alberta Gas Trunkline to Templeton Engineering Company  
19 in 1970. Mr. Blair requested that the company perform  
20 a problem definition, defining of the problems, for a  
21 vision that he had of a gas pipeline from Prudhoe  
22 Bay, Alaska, to Alberta. In the course of preparing  
23 a problem definition for Mr. Blair, the people at  
24 Templeton Engineering came to the question of how to  
25 look after the environment, and it soon became evident  
26 that there were many unique aspects to this project  
27 which, together with unique environmental conditions  
28 of the north, would demand very specific environmental  
29 protection measures if the project were to go ahead.

30 The original environmental





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1  
2 issue for the Board was, and still is, "how can environ-  
3 mental protection measures be built into a large pro-  
4 ject such as this proposed pipeline?" Out of this issue  
5 grew <sup>a</sup> fundamental objective of the Board which was  
6 actually to achieve environment protection in a rea-  
7 sonable degree, rather than just to make recommenda-  
8 tions. This objective is central to the Board's  
9 concept. We realized that the building of environment  
10 protection measures into the project could be accompli-  
11 shed in perhaps one of four or more ways.

12 The four that we considered  
13 were:

- 14 1. That the pipeline company could hire a staff of  
15 environmentalists.  
16 2. That the pipeline company could hire a group of  
17 environmental consultants to perform specific assign-  
18 ments.  
19 3. One could assume that the government would look  
20 after the environment.  
21 4. That an Independent Board could be established.

22 Although we have never heard  
23 of such a Board being formed in Canada, there had  
24 been precedents in the United States and Sweden.

25 We also believe that it is  
26 incumbent on the one who proposes an action, whether  
27 it's the passage of a law by government, or the con-  
28 struction of a project by private enterprise, that  
29 it's his responsibility to demonstrate the effect of  
30 his proposed action. In this case it meant the effect



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on the environment.

We then tried to estimate the chances of success in achieving environment protection in each of these four alternatives. We estimated the first two alternatives in which the environmentalists would be on staff or as consultants could be over-ridden by the hierarchy of financiers, managers, designers, pipeliners, contractors, transportation companies and labor unions. This has happened many times in my experience, and I have found that if an environmentalist makes too much noise about his concern, that he soon gets his terms of reference changed to silence him. By the way, I wasn't referring in that context to Canadian Arctic Gas Study Limited because they weren't formed at that time.

With regard to the third alternative in which the government would be sole responsibility for protection of the environment, we estimated that there were two major drawbacks.

(1) No set of regulations existed which government people could use to achieve environment protection on this particular project.

(2) The whole matter of regulation was in a state of confusion, and this was apparent from the outset and still is.

The problem was that the Department of Indian Affairs & Northern Development by its very name is implied "development". In addition, DIAND has granted permits for the exploration of oil



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1  
2 and gas in many areas of the north, and one would  
3 assume that if the oil and gas were found, that they  
4 would be taken out of the north. And yet DIAND has  
5 a social responsibility to the natives, their culture,  
6 which includes the environment. It also has, through  
7 its own offices in Territorial Governments, a responsi-  
8 bility for environment protection measures. As for the  
9 Department of Environment, it had expertise and some  
10 regulatory functions, but certainly did not have the  
11 authority needed to control the project.

12 Finally, the National Energy  
13 Board in reporting to the Minister of Energy, Mines &  
14 Resources, had responsibilities for controlling pipe-  
15 lines. Section 44 of the National Energy Board Act  
16 states that:

17 "The Board in considering a certificate,"  
18 and I add there, I think it's referring to the  
19 certificate of public convenience and necessity,  
20 "shall take into account all such matters  
21 as to it appear to be relevant."

22 Assuming that the phrase:

23 "All such matters"  
24 could be interpreted these responsibilities would  
25 include environmental matters, in this confusing  
26 array of responsibilities and jurisdictions, I was not  
27 convinced that environment protection had a very high  
28 priority. So we turn therefore to the fourth alter-  
29 native, that of an independent Board and endeavored  
30 to define what such a Board would be, and how it could



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1  
2 overcome the above problems.

3 To perform its function, such  
4 a Board would have to not only be autonomous, but  
5 appear to be so. Otherwise it would revert to becoming  
6 a consultant to its sponsor in which it responded  
7 to specific requests from its sponsor. The Board would  
8 have to be able to study what it felt it should study,  
9 rather than be given assignments. It should report  
10 its findings publicly and encourage inputs from the  
11 public, and in particular the scientific community as  
12 its studies progressed, not as a report at the end of  
13 the job. It should make a contribution to the scientific  
14 process of predicting environmental impact and  
15 in public participation.

16 This, in short, was the Board  
17 concept, and it was this concept that we put to Mr.  
18 Blair. He liked the idea and he agreed to fund it for  
19 a year, and so the Board was formed.  
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To be able to perform the function, the Board set out for itself, it would have to be able to combine the expertise of senior engineers and scientists who have experience and mature judgment, but little free time, combine this with the energies of young, active researchers who could devote full time to office and field studies.

At this point, Templeton Engineering Company turned the staffing and the administrative functions of the Board to its subsidiary, Inter-disciplinary Systems Limited, which organization has supported the Board ever since. Mr. Doyle, who is here today, is general manager of that firm and has provided the delicate function of supplying staff to do research work, draft reports, and support the Board.

The Board, to fulfill its function, should yearly re-evaluate the validity of a working premise that under certain circumstances the gas pipeline could be built with what was to us an acceptable level of environmental change. I think this is quite important because when we talk about terms and conditions, we are really saying, "What are the terms and conditions if the pipeline is built?" Every so often you have to stop and say, "Even if these terms and conditions are met, can I accept the project?"

We found that we could, and the preparation of our interim reports done annually was the vehicle we used to come to this re-appraisal.



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In Chief

1  
2 Finally, we felt that the  
3 Board should validate the predictions and control  
4 measures by making a post-construction evaluation if  
5 the project went ahead, so that future projects could  
6 profit by the experiment.

7 Now, as to the type of people  
8 -- I don't think I should say "the type of people we  
9 should get on the Board" because they might do some-  
10 thing to me -- but this was the way we approached it.

11 THE COMMISSIONER: Excuse me,  
12 just before you do that, Mr. Templeton, I didn't  
13 follow one thing you said.

14 Q Did you -- you described  
15 your working premise. Did you proceed on the  
16 assumption that you could build a pipeline with minimal  
17 or acceptable environmental damage, or were you  
18 seeking to test that proposition? I didn't quite  
19 understand you.

20 A We assumed at the outset,  
21 and we discussed this quite thoroughly, can we, with  
22 what we knew at the outset, accept the idea of a gas  
23 pipeline from Prudhoe Bay to Alberta? We came to  
24 the conclusion with what we knew then, yes, we could.  
25 I think if we couldn't have accepted the thing, we  
26 probably shouldn't have formed the Board. I think we  
27 accepted that premise, but we recognized that there  
28 were a great many things we didn't know and that the  
29 interim reports gave us this opportunity to stop once  
30 a year and say, "Well now, we've done our work for this



Templeton, Adam, Bliss,  
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1  
2 year. Can we still accept it?" Because I think if  
3 somewhere along the line we found that we couldn't  
4 accept it, we would have -- we should have said so.  
5 Does that answer it?

6 THE COMMISSIONER: Yes, I  
7 follow you.

8 A I think to make a Board  
9 workable and to get active participation, make quick  
10 decisions, because we didn't know when this -- we didn't  
11 know at the time when the project might be approved,  
12 there should be a fairly small Board, say seven or  
13 eight members, but seven or eight members, there are  
14 many more than seven or eight disciplines involved,  
15 and if you tried to cover every discipline you'd have  
16 such a large Board that it would be unworkable, in  
17 my opinion; and so we tried to include what the systems  
18 engineer calls a T-shaped man, and that means a person  
19 with a considerable skill in one discipline, and a  
20 broad view in several others. Some of the Board  
21 members have complained about my terminology of T-  
22 shaped man, that they're not, but I think they're  
23 referring to a different view than I have.

24 The members also need to  
25 develop a rapport, not in agreement with each other's  
26 opinions, but an understanding of each other and the  
27 disciplines they represent, and unless there was this  
28 rapport, trade-offs as to what was significant and  
29 what was insignificant -- and when you're talking about  
30 impact, would lead to perpetual confrontations, and





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In Chief

1  
2 conclusions and efforts would take a similar form to  
3 reports written by a large committee which really expres-  
4 sed the least controversial views of the members which  
5 we didn't want. So the rapport was necessary, it  
6 takes time. We formed the Board in 1970 and began  
7 working out our objectives, and eventually we decided  
8 on the following:

- 9 1. To promote openness. We believe that all pertinent  
10 environmental information, whether in the hands of  
11 government, the applicants, or university people, should  
12 be made public and discussed publicly.
- 13 2. To promote discussion on environmental matters  
14 inside the pipeline company and in the regulatory  
15 authorities. To also contribute to the public under-  
16 standing of the environmental issues. There is an  
17 informed public ready and able to discuss environmental  
18 issues, and all we have to do is to present them and  
19 delineate the important from the less important.
- 20 3. To develop a methodology for converting environmental  
21 research into environmental protection measures and  
22 controls.
- 23 4. To publish an environmental impact assessment.
- 24 5. To monitor the effects of the project on the  
25 environment if the project goes ahead.
- 26 6. To publish a post-construction evaluation of the  
27 project to evaluate not only the actual effects on the  
28 environment after the project is finished, if it  
29 goes ahead, but also the effectiveness of the control  
30 methods used.



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In Chief

So this was the concept that we had when we started, and so we proceeded from there.

Perhaps now we could consider how we approached the overall problem of building environment protection into the project - into this project. I think it might be useful to you, Mr. Commissioner, because I think perhaps you were telling us this on May 23rd when you were telling us to get at the terms and conditions, and hopefully I think it might even be useful to some of the participants of the hearings who were also instructed to make their terms and conditions, or the terms and conditions that they are to recommend to you to be included.

I do not suggest that the participants should necessarily come to the same conclusions on environmental matters we did, but I think a review of them might be useful. Our presentation refers only to the environmental aspects and the native inter-action with the environmental does not include the social and regional economic aspects.

In the first place, one naturally assumes, when I was talking about impact assessment, that it is an established methodology and all you need to do is plug in some research and out will come a magic set of figures which will then indicate a positive or negative balance, which will prove to all what the impact of the project will be. Unfortunately, this is not the case. The impact assessment process is barely in its infancy, and



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1  
2 while there are a number of methodology, there is no  
3 standard procedure or established methodology; but this  
4 is only part of the problem. The components of the  
5 environment and their relationships to each other  
6 are extremely complex and are not well understood.  
7 Thus when a change is introduced, it is hard to anti-  
8 cipate all of the primary effects, much less the  
9 secondary and tertiary effects; and further uncertainty  
10 is added by trying to predict "what is man going to  
11 do?" It is difficult to anticipate several years ahead  
12 in the event of a pipeline, what the contractors, the  
13 pipeline company, the suppliers, the transportation  
14 companies, and the government control staff are going  
15 to do, because these are people. And because of this  
16 latter uncertainty, we have specified a level of  
17 performance by both the applicant and the government  
18 upon which our impact predictions are based.

19 To state it another way, we  
20 established a working premise that was possible to  
21 build a gas pipeline with an acceptable level of  
22 impact, and then in testing and re-testing this  
23 premise we developed and defined the level of  
24 performance required by both the applicant and govern-  
25 ment to achieve this. It therefore follows that if the  
26 level of performance which we shall recommend to you  
27 is not achieved, our environmental impact predictions  
28 may be invalid.  
29  
30





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In Chief

6045

1 Our first approach  
2 was to outline our environmental concerns in a very  
3 simple matrix form, and environmental matrix is  
4 a chart where you plot the activities that will  
5 cause impact on one axis and the environmental  
6 components on which you expect impact on the  
7 other. Where the lines meet, they form little  
8 boxes and you can express in each little box your  
9 estimation of impact.

10 We plotted the components  
11 of the environment as one axis and the components  
12 of the construction activities as the other, and  
13 it might be interesting to you to note the results  
14 of this first matrix and it came out that the serious  
15 impacts would be on Caribou, fish, vegetation and  
16 birds.

17 It might also be interesting  
18 to note that in the first effort we missed many concerns.  
19 Gradually other elements were added and our final  
20 list included land in its natural state, terrain,  
21 northern peoples, birds, mammals, fishes, vegetation,  
22 archaeological resources, air, water, and the total  
23 impact of this project and also the cumulative  
24 impact of this and other projects which will  
25 naturally follow it.

26 The difference between this list  
27 and the earlier one shows the need for a constant  
28 reevaluation in undertaking impact studies.

29 Having estimated at the outset  
30 that the foremost serious concerns were caribou, fish,





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1 vegetation and birds, we set out to study these  
2 components of the environment so that we could  
3 first understand them in their natural state. We  
4 call this developing an environmental setting and  
5 to do this the support staff proposed many research  
6 projects to the Board similar in detail to our  
7 request for academic research to the National  
8 Research Council. Those projects that we approved  
9 were performed under the technical guidance of one  
10 or more of the Board members. A working relationship  
11 was thus established between the Board members and  
12 the support staff in the early stages that later on  
13 made it possible for the group to make trade-offs  
14 in interdisciplinary studies. I cannot stress to  
15 strongly the fact that you cannot take a group  
16 of people from various disciplines and various degrees  
17 of stature in those disciplines with varying personality  
18 traits and throw them all in a pot and expect to  
19 instantly produce a group which can make a proper  
20 set of tradeoffs between one component of the environment  
21 and another.

22                   Until the members of the  
23 group understand and accept each other as individuals,  
24 the interdisciplinary process is not possible.

25                   When we studied any en-  
26 vironmental component, it was necessary to constantly  
27 evaluate the probable significance of impact and cast  
28 off those aspects that appeared insignificant. Unless  
29 you do this, the number of studies expand exponentially  
30 and you lose sight of the main purpose of your studies.



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In Chief

1 The development of the ability of a group to  
2 stop studies in which the impact appears to be in-  
3 significant takes time and is a very painful  
4 process.

5 The first two years of our  
6 work were thus spent on researching the environmental  
7 setting and on gathering as much data as we could on the  
8 impacts of old disturbances.

9 At the end of each year we  
10 drafted and published an interim report and this,  
11 as I mentioned earlier, forces you to make your decisions,  
12 and when you publish it widely, your peers will soon  
13 tell you if you are not on the right track.

14 Having done two years of field  
15 studies, we then began to put the individual impacts  
16 into some kind of form, and then tried to assess the  
17 secondary impacts. For example, if you are studying  
18 forest fires, you can see a direct, primary impact on  
19 vegetation, which in the short term may be regarded as  
20 negative. The resultant addition of nutrient to the soil  
21 caused by the burning of the vegetation is a secondary  
22 effect which on the other hand can be considered  
23 positive. For some animals the effect is negative,  
24 and for other animals the effect is positive. But if the  
25 magnitude of the fire is such that it will wipe out an  
26 entire habitat, the overall effect will be negative.  
27 In addition, the fire may destroy the peat mat which  
28 can allow thermal and mechanical erosion to start,  
29 resulting in negative and secondary effects to  
30 terrain and possibly tertiary effects to fish through



1 siltation of water bodies. Thus, one cannot  
2 consider the impact on one component of the environment  
3 in isolation from all others.  
4

5 Each discipline must define the  
6 impacts and then start putting them together to  
7 evaluate the secondary and tertiary effects as best they  
8 can, and this process takes a number of tries before  
9 an integrated approach is achieved.

10 At this point, we constructed a  
11 larger matrix than our first one and it is very  
12 difficult to show these matrices in -- to a large  
13 group, and perhaps at your leisure you could look  
14 at these matrices which we will leave in our atlas  
15 in the room and you can look at it at coffee break  
16 or at the end of the session. I don't expect you can  
17 read this -- it isn't intended that you should, but  
18 this first slide shows the full potential matrix,  
19 interaction matrix with the construction and operation  
20 components down the side, all those lines down the  
21 side represent different construction operations, and  
22 the environmental components are along the top.

23 The major construction and  
24 operation components we considered are shown on this  
25 slide and each of these were broken down into activities  
26 or sub-components.

27 This slide shows these  
28 activities for two of the components, wharves and  
29 stockpile sites, and we deliberately picked these  
30 for the example because we are not -- there are many  
activities apart from the actual pipelining activities





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1 and these ancilliary activities are often more a  
2 worry to you in considering environmental conditions  
3 than are the actual pipelining activities.

4 In total we considered  
5 218 preconstruction, construction, operation and  
6 maintenance components. Similarly we considered  
7 the major environmental components as is shown in  
8 this slide and each of these were divided into sub-  
9 components.

10 This slide shows these sub-  
11 components under five major components -- terrain,  
12 vegetation, air, water, and fish. In total we  
13 considered 57 environmental components and thus  
14 combining the two we considered 218 activities  
15 that related with the environment and -- 218 construction  
16 activities and 57 environmental components making  
17 a total of 12,426 primary reactions. That was  
18 the number of little coloured in squares that you  
19 saw on the first slide.

20 There are some people who  
21 would use a matrix to measure impacts. In each of  
22 the little squares that we showed on the first slide,  
23 they evaluate the impacts on a scale of one to five  
24 or one to ten, add up the numbers and arrive at a  
25 quantitative figure which represents the seriousness  
26 of the various impacts. We do not agree that the  
27 assignment of numbers to the matrix is valid in this  
28 case. There are far too many activities over too  
29 large an area, too many components of the environment  
30 and too little is known about them to meaningfully set



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1 down numbers. Of course we recognize that many  
2 people say that we have really set down numbers on  
3 a scale of one to three because we coloured those little  
4 squares in red for "serious", yellow for "moderate" and  
5 the ones that were white were blank, for "Minor". WE  
6 steadfastly refuse to assign numbers to those because  
7 we feel that the addition of them will not be  
8 meaningful. We believe that in this case  
9 judgment should be the means of measurement, not  
10 mathematics. A matrix is only one of the tools used  
11 to make an informed subjective judgment. We  
12 believe, however, that it is a valuable tool.

13 When you start to fill in the  
14 matrices, you start to question yourself and the  
15 other disciplines as to what you mean by impact and  
16 what assumptions are being made as to the a  
17 activities that cause the impact. And this is the  
18 first time you get into the interdischiplinary  
19 process. Up to now, the work has been of a multi-disci-  
20 plinary nature, with each dischipline carrying on its  
21 own work in its own way. When the disciplines start to  
22 challenge each other's assumptions and to decide  
23 collectively what is significant and what is not,  
24 you are starting inter-disciplinary process.

25  
26  
27  
28  
29  
30



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Opinions can readily be exchanged on the impacts on birds versus caribou -- that's opinions but not necessarily agreement -- but not so easy is the exchange regarding wilderness because this is not recognized as an established discipline. Future generations do not have a representative in your group.

In the testing of assumptions used by each discipline, the group had to consider specific sites to show what precisely the problem was at that certain location. When they had qualified much more closely their specific concerns, they returned to the matrix and were able to make more specific impact predictions.

In the course of these exchanges of opinions, you soon find that some people assume the worst case, and others assume a case that is likely to happen. And so you can see that the pessimists and the optimists in your group have ample opportunity for conflict. Hence the importance of working together for a while to establish the essential rapport necessary to be able to make inter-disciplinary decisions rather than an accumulation of individual opinions.

We have made a worst case matrix which we call a potential impact which will identify as far as the transcript as A-6. This is the potential or worst case matrix, and once again I realize you can't read it, and that requires, the initial one,



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1  
2 the potential one requires -- assumes very little  
3 control, then we come to a probable regional impact  
4 matrix which is identified as A-7, gives you a closeup  
5 of a corner of the matrix to show how we felt the  
6 matter -- the impacts that would probably happen. You  
7 can perhaps, if I can go back, show the reds which are  
8 the serious impacts, and the yellows that are moderate,  
9 you'll notice the greater preponderance of the colors  
10 in the first one.

11 THE COMMISSIONER: Excuse me,  
12 what does the -- this is coastal, I take it, you mean  
13 the North Coast?

14 A Yes, this is the coastal,  
15 this is part of the coastal alternative, this particular  
16 example.

17 Q Yes.

18 A We did it for each region  
19 but -- and you have to do it by regions because the  
20 impacts are different for different segments of the  
21 route. But this particular example is the coastal  
22 alternative.

23 Q The last slide, A-6,  
24 did you say to what region that applied?

25 A We did it for each region  
26 but I think that is a compilation, if I'm not -- it's  
27 a compilation of them all. We didn't in our atlas  
28 show the worst case for each region because we were  
29 trying to demonstrate the worst case on an overall  
30 basis and get down to the details on the -- what is





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1  
2 likely to happen because these tie into the maps  
3 which we'll discuss later.

4 This slide once again you  
5 can't read, but it shows the magnitude of the numbers  
6 of activities that you have in various regions. It's  
7 the full probable regional impact matrix with construc-  
8 tion and operation components down the side, and the  
9 environmental components across the top, and then the  
10 five regions that we considered are shown in the  
11 -- along the top. This is a slide, A-9, and shows the  
12 regions that we considered. In other words, the  
13 interior alternative was considered separately from  
14 the coastal alternative because the environment is  
15 different, the area around the delta region is unique  
16 in itself and doesn't apply to either the coastal or  
17 the Mackenzie, and then the North Mackenzie region  
18 and the South Mackenzie region. Each one of those  
19 are shown in a matrix in Volume 3.

20 We then went back to the  
21 project description and said, "We now know what the  
22 components of the environment are, and we also know  
23 many of the local, or in our jargon, site-specific  
24 impacts," and we keep using this and I perhaps should  
25 define it. A site-specific is an impact at that  
26 particular site, a local impact in some cases almost  
27 a spot; other cases, a little broader.

28 We said, "What can we do to  
29 reduce the impacts?" We then prepared a series of  
30 maps on which we showed the environmental components



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and the project components, and on these maps we put up flags to show the site specific impacts, and this slide is A-10 which shows map No. ES-1 and the large blue arrow indicates the location of this map along the pipeline route, and the small arrow points to a flag which we'll describe in a minute.

Slide A-10-A shows a closeup of the same flag, and the legend is provided down below. We tried to do all of this environmental setting and all of the impacts as much by visual means rather than words because they seemed to us to be of more use to construction workers who might use them and are less inclined to read a long description, but after they get used to it they can recognize a picture of a grizzly bear or even the picture of a garbage bag or a fish resource or a person, and so those flags are what we call site specific impacts and you probably can't read it, but along the left-hand side of the flag are a "W" for winter, spring, summer and fall or autumn, and so if it's colored red in spring, summer and fall, on the left-hand side, those are the seasons of the year that you -- that there is a serious concern because it's colored red. The next line across shows a picture of a grizzly bear, and in many cases the next column would be filled with the construction activity, or perhaps it has a construction activity that I can't see, it's garbage we're worried about.

So that there is a serious impact, and No. 3 indicates a note on the legend that



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1  
2 goes with the map as to the description of it. The  
3 lower one is another impact to do with fish, which is  
4 moderate. There's a moderate impact in the springtime  
5 to fish caused by people.

6 That was -- I should have let  
7 that describe itself instead of spelling it out to  
8 you, but that's the legend that shows the winter,  
9 spring, summer and fall, the environmental component,  
10 the construction component, and the magnitude of the  
11 impact by the color of the pointed part of the arrow,  
12 and the recommendation that goes with it is identified  
13 by that number.

14 We chose the word "flag" be-  
15 cause it is often used in this sort of situation, and  
16 just as you would flag a danger point, we used a flag  
17 on our maps to show the precise location, the precise  
18 worry that we had at that location, and what had to  
19 be done about it. Having gone through all of these,  
20 we were then in a position to write our impact report.  
21 What we wrote is contained in questions 1 to 12  
22 in Volume 1 of our final report, and represents the  
23 Board's composite opinion of the impact on the  
24 environment which will likely occur.

25 You will remember, however,  
26 that I said earlier that we made certain assumptions  
27 along the way that the applicant and the government  
28 would control the project with a definite amount of  
29 skill in environment protection. This was where  
30 we diverged from the conventional idea of an impact





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assessment which would only list the probable impacts  
that will occur. We found that unless the applicant  
and the government used a degree of skill to control  
the project, the degree of skill that we have  
specified, our predictions would likely be invalid.



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1 Perhaps we could have the  
2 lights on again.

3 We hope to present, in these three  
4 days, our reasoning as to what is needed in environmental  
5 control and specifically what environmental control  
6 should be applied by the applicant, by the Government  
7 and by the public, and now to get back to  
8 our approach to the matter of project controls.

9 We set out to consider if the  
10 system of controls proposed by the applicant and the present  
11 system of governmental controls were adequate. The  
12 applicant's system is contained in the application,  
13 but the government's system is not so easy to find.  
14 There are some 40 laws that are applicable, but the  
15 question is: Can they, or will they, be applied to  
16 control the project?

17 Having studied the existing  
18 or proposed means of controlling the project,  
19 we then addressed ourselves to making specific rec-  
20 ommendations as to how we felt the project should be  
21 controlled. This is spelled out in volume II of  
22 our report entitled, "Towards an Environmental Code."  
23 It is written in a style similar to a construction  
24 code. It spells out the performance levels  
25 required by the applicant and the Government which  
26 the Board believes will limit the impact of the  
27 project to an acceptable level.

28 Finally, we came to our  
29 conclusion of acceptability. I think I should read  
30 these three paragraphs from the conclusion of



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1 our volume I of our report because if the conclusion  
2 is presented first, perhaps the rationale that we  
3 will be going through will be clearer.

4 It goes as follows: The  
5 Board's unanimous conclusion is that the applicant's  
6 proposed project is only conditionally acceptable from  
7 an environmental point of view.

8 The Board has found that if  
9 reasonable precautions are taken and certain activities  
10 restricted to specific times of the year and locations,  
11 as indicated by our Atlas and suggested Environmental  
12 Code, then environmental damage "could" be held  
13 to what in our opinion is an acceptable level. This  
14 does not imply, however, that damage "will" be  
15 held to what in our opinion is an acceptable level.

16 Though much work has been done  
17 there are still inadequacies in the detail of the Appli-  
18 cant's exhibits and its commitment to environment  
19 protection. There are also inadequacies in govern-  
20 mental mechanisms; in particular those pertaining  
21 to enforcement available to control the project.  
22 These inadequacies should be resolved before the  
23 applicant is given a permit.

24 That is the end of our accep-  
25 tance paragraph.

26 Now, I would like to turn  
27 to another heading. I realize that you are getting  
28 tired of me, but it won't be long now. And this  
29 had to do with the -- our relation to the sponsor,  
30 Canadian Arctic Gas Study Limited and the other



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1 bodies that went before it.

2 Since its inception, this  
3 Board has been sponsored sequentially by three  
4 organizations, the Alberta Gas TRunkline Company  
5 Limited, Gas ARctic Systems, and Canadian Arctic  
6 Gas Study Limited. Throughout these relations our  
7 autonomy and our external or public role have generated  
8 considerable controversy. However, our presence here  
9 today is to the credit of each of these sponsors  
10 who, despite our differences, continue to support us.

11 Our practice has been to  
12 hold monthly Board meetings, and in our  
13 formative years with Alberta Gas Trunk Line we  
14 held a number of meetings with a representative  
15 of the sponsor. A recurring problem during that time  
16 was the lack of a detailed project description from  
17 which to outline our concerns. From our sponsor's  
18 point of view, however, the lack of clearly defined  
19 environmental problems was contentious, because  
20 if we could have supplied this, then the project des-  
21 cription could have taken the problems into account in  
22 the first instance. In other words, we said to them,  
23 "You tell us what the project is going to be", and  
24 they said, "No, you tell us what the environment is."  
25 Thus, almost from the outset, the designers and the  
26 environmentalists were seeking very specific  
27 information from each other and basically not  
28 getting it.

29 As other organizations  
30 joined Alberta Gas Trunk Line Limited, in





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1 the consortium Gas Arctic Systems, we experienced some  
2 raised eyebrows. The thought of funding an  
3 autonomous board, free to publish its findings -- without  
4 editing -- to the sponsor's foes as well as  
5 his friends, and to dispose of its funds as it saw  
6 fit, was not exactly a standard operating practice  
7 to some of the members of Gas Arctic Systems.  
8 However, our autonomy and public roles were re-  
9 affirmed in our discussions with Gas Arctic and this  
10 reaffirmation was reported publicly in our "Re-  
11 evaluation of the role of the Environment Protection  
12 Board" which was published in March 1972.

13 The lack of information  
14 concerning the project description continued. This  
15 made it difficult for us to plan our research  
16 programs and to advise the sponsor of the specific  
17 environmental impact predictions he wanted, and to  
18 avoid an impasse in June 1972 we prepared  
19 our Interim Report No. 2, which I have just filed  
20 this afternoon, entitled, "Environmental Implications  
21 of the Engineering Design of a Gas Pipeline from  
22 Prudhoe Bay Alaska to Alberta", and in this report  
23 we raise many questions about the project description,  
24 stressing that without answers to them, environmental  
25 impacts could not be predicted. The answers we  
26 needed, however, were not readily available and  
27 many of the questions remained unanswered until  
28 late 1973. Still others which we will be discussing  
29 later, are still unanswered.

30 The publication of our



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1 interim report livened up some of the meetings  
2 between us and Gas Arctic. In particular, the  
3 report brought the autonomy of the Board clearly into  
4 focus to those members of Gas Arctic who until then  
5 viewed us as a consultant that should be directed and  
6 controlled. This document brought home the reality  
7 of the Board Concept.

8 This was also the  
9 period of amalgamation between Gas Arctic  
10 Systems and the competing consortium Northwest Project  
11 Study Group into what is now known as Canadian Arctic  
12 Gas Study Limited. Again, the Board came under very  
13 close scrutiny by the newly formed consortium. The  
14 Northwest Project Study Group had retained a number  
15 of environmental consultants, who were carrying out  
16 studies for their client, and up to that time  
17 their reports had not been published.

18 In the negotiations with the  
19 new consortium we agreed to greatly reduce our field  
20 research effort providing we could have full access  
21 to the work of the engineering and environmental con-  
22 sultants. Although we felt that monitoring during  
23 construction and a post construction evaluation were  
24 important facets of the overall process, these  
25 questions were left unclear as CAGSL felt that they  
26 could no longer make a long term commitment. The  
27 new relationship was outlined in our newsletter of  
28 February 1973 "Changes in the Role of the  
29 EPB", and perhaps I should -- oh, all right, we will  
30 file it later.



## The autonomy of the Board

None the less, CAGSL has continued to give us support to this date.

The internal or advisory role that I mentioned earlier, that we originally set out for ourselves has operated sporadically and with some difficulty with its success depending on how the Board was viewed at the time by the sponsor.

To exchange information between the sponsor and ourselves, we invited a representative of the sponsor to attend many of our Board meetings except those in which we discussed our reports -- or the sponsor, I might add. The sponsor did not participate in any way in the writing or editing of our three interim reports, our impact assessment report, our brochures, our newsletters or this presentation. During the early draft stages of the application we actively participated in a week-long major review of the project in April 1973. This was an excellent start since it reviewed the pipeline alignment sheets and the draft project description in detail. Many of the Board members and its support staff supplied by Interdisciplinary Systems Limited, participated in the two working groups that were concerned. Unfortunately there were no subsequent sessions like this for the Canadian portion of the pipeline. AS





1 our sponsor continued to revise and redraft the  
2 material for application, we were given an  
3 opportunity to submit comments on various subsections  
4 as they became available. It should be apparent  
5 from our presentation in the next two days that  
6 we don't entirely agree with what was ultimately  
7 produced.  
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THE COMMISSIONER: Sorry, you  
don't want?

A Entirely agree with  
what was ultimately produced in its entirety.

Since publication of our  
impact assessment in September, 1974, our sponsor has  
advised us that funding would be limited to preparation  
for and participation in this Inquiry, because of the  
many uncertainties with which he is confronted. It  
is this support which has made possible for us to pre-  
pare for this hearing and present ourselves today.

Finally, I would like to say  
that although we have had our battles with each of  
our sponsors, we must give them full marks for making  
our continued existence possible. I know of no other  
organization in either the government or private  
enterprise sectors of Canada which have sponsored an  
autonomous group such as ours, having as it does goals  
that are different from those of the sponsor, yet is  
able to publish its opinions to friends and foes alike  
without the sponsor's control or rights of edit.

Perhaps I could go now to  
a section on the work of the Board. I earlier outlined  
the approach which we took the problem of achieving  
--

Q Excuse me, Mr. Templeton.  
I think we'll just take a break for coffee now, if  
you don't mind.

A Fine.



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(PROCEEDINGS ADJOURNED FOR FEW MINUTES)

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

THE COMMISSIONER: Carry on,  
Mr. Templeton.

A Before the break I outlined the approach that we took to the problem of trying to achieve environmental protection, and now, Mr. Craik will outline the work performed by the Board in outline form only, and the purpose is to, in including it in this presentation, is to indicate the extent of the work so that you can judge whether this work, plus the experience of the Board members and the staff is adequate to make the impact predictions that we've made. Included in this presentation will be the roles that the Board tried to fill in advising the sponsor on the project itself, and in public participation. Mr. Craik.

WITNESS CRAIK: Mr. Commissioner, I'll be dealing then with the work of the Board, and I want to describe in some detail the progress of the research work and the roles of the Board. It may be somewhat detailed for your requirement; if that happens to be the case perhaps it would be indicated whether I'm getting into too much detail.

The work of the Board covered three major areas. One was our field and office research which provided the background for the other two areas, and the other two areas were our advisory role, which involved meetings and exchanges of infor-



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mation with our sponsor, and our external public role which centred on the publication and distribution of all our research and findings.

First of all regarding the research role, field and office research was a major aspect of the work of the Board. Our field research started in 1971 and continued in 1972 during which time we gathered base line data and conducted disturbance studies on caribou, fish, waterfowl, vegetation and re-vegetation. This work was concluded in the summer of 1974 when we conducted disturbance studies on terrain and vegetation, and on stream environments. Our ongoing office research program was designed to supplement our field research and to focus on areas where no field research was conducted. Initially, our research efforts were directed at bringing together the available literature on the project area. Then we selected support staff, assigned them to specific areas, and in 1971 drew up an initial field research program designed to gather base line data on caribou, fish, vegetation and waterfowl. We were particularly conscious of <sup>aspects of</sup> the project that could affect the reproductive success of different species. The Porcupine caribou herd was thus designated for study because at that time the proposed alignment was through the Richardson Mountains and along the Porcupine River, and it intersected with the known traditional migration paths of this herd. Accordingly, we conducted a field program to monitor the movement of the herd from the





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1  
2 winter ranges north across the proposed alignment to-  
3 wards the calving grounds. Data were gathered on  
4 movements, population size, herd structure, and criti-  
5 cal ranges. The results of this work, together with  
6 comments on the possible effects of pipeline construc-  
7 tion, are presented in Appendix 1 of our interim report  
8 No. 1, which has been filed as No. 139 with you today.

9 I'd like to point out, however,  
10 that the coastal alignment was not under consideration  
11 at that time. So our studies concentrated on the  
12 Richardson Mountains and Old Crow area, both north and  
13 south of the Porcupine River. During the summer of  
14 1971 we carried out waterfowl surveys of selected  
15 wetland areas between the Peel and Mackenzie Rivers  
16 along an alignment being considered at that time,  
17 namely south of the Mackenzie River and across the  
18 river near Sans Sault Rapids.

19 The Mackenzie Delta gas field  
20 was not in the picture at that point, as far as our  
21 studies were concerned. This work provided us with  
22 base line data on the species and number of waterfowl  
23 present in a large area for which data were unavailable.  
24 The area also concerned us because of the possible  
25 drainage interruption and its consequences in terms of  
26 affecting the re-charge of downslope wetlands. The  
27 results were presented also in Appendix 1 of interim  
28 report No. 1.

29 During this same period the  
30 staff flew a waterfowl transect from Gold Creek, Alberta



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1  
2 to Fort Simpson along the then proposed alignment.  
3 In the same year we undertook a literature~~/~~review of the  
4 possible effects of pipeline construction on~~/~~fish  
5 populations present along the proposed routes. We were  
6 particularly concerned with the possibility of active  
7 stream beds being used as sources of gravel. We  
8 gathered available information on the spawning habits  
9 of fish species to be encountered along the route.  
10 IN addition, we documented the effects of increased  
11 siltation and turbidity on fish, fluvial considerations  
12 and habitat damage as caused by logging and access  
13 activities elsewhere in the world. This work is  
14 reported in the nature and mechanism~~s~~ of problems  
15 that might arise to fish from pipeline construction  
16 activities, which is part of Appendix 2 of interim  
17 report 1.

18 During the period June to  
19 August, 1971, we undertook a helicopter based sampling  
20 survey along all streams to be crossed by the proposed  
21 alignment from the Hume and Ramparts River watersheds  
22 near Sans Sault Rapids, west to the Peel River. Data  
23 were gathered on species present, size, weight, and  
24 mode of capture. Subsequent laboratory work determined  
25 the ages of these so that growth rates for fishes  
26 in northern watersheds could be computed. Data on  
27 the watershed were also gathered including width, depth,  
28 flow rate, temperature, and sediment composition. These  
29 data are presented again in interim report No. 1.

30 We should point out here that



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1  
2 our field research strategy had to be designed to  
3 maximize the amount of base information retrieved  
4 because we did not know when an application would  
5 be made, and therefore we had to be prepared to address  
6 environmental concerns for the project at almost  
7 any time. In the botanical field, we concentrated  
8 our efforts for 1971 in that area where data were  
9 lacking. This was the area from the Peel Plateau near  
10 Fort McPherson west to the Old Crow Mountains. We  
11 identified and then discussed the distribution of plant  
12 communities along the route here. Data on species,  
13 per cent cover, combustible standing crop, active layer  
14 depths, and soil particle size were presented and  
15 analyzed in Appendix 3 of report No. 1.

16 Finally, in 1971 we conducted  
17 re-vegetation trials at Norman Wells, Inuvik, and  
18 Prudhoe Bay to determine which plant species could be  
19 most successfully sown on disturbed areas at different  
20 points along the pipeline corridor. Data were gathered  
21 on different seeding dates, fertilizer applications, and  
22 use of nurse crops to establish early growth and rapid  
23 cover. This work is reported in Appendix 4 of report  
24 No. 1.

25 Working from this data base  
26 from the literature and from ongoing research by  
27 others, we prepared our first interim report presenting  
28 our appraisal in late 1971, of the effects of the  
29 construction and operation of the gas pipeline on  
30 various components of the environment. At that time





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1  
2 the project was defined only in broad conceptual terms,  
3 and it was not until June, 1972, that we were in a  
4 position to address the engineering aspects of the  
5 project. Accordingly, we brought together our concerns  
6 and presented them as interim report No. 2 entitled:

7 "Environmental Implications of the Engineering  
8 Design,"

9 and this has been tabled here as document No. 138.

10 In this report we dealt with the possible effects of  
11 engineering design on the environment and what the  
12 impact might be from some of these effects. We also  
13 posed a series of questions for the pipeline designer  
14 that would draw attention to those design aspects that  
15 could have adverse environmental effects.

16 Early in the summer of 1972  
17 the proposed coastal alignment was raised for consider  
18 -ation. Simultaneously the alignment was shifted further  
19 north along the Mackenzie River. Accordingly, our  
20 continuing research effort in 1972 had to shift its  
21 focus in mid-summer of that year to take into consider  
22 ation the coastal alignment. Later in that same year  
23 the Richards Island connection was added to the pro  
24 posed project.



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Our research on the porcupine Caribou herd continued in 1972, but was now extended to the coastal calving grounds. Picking up from the 1971 fall migration and tagging effort, the staff ascertained the later winter distribution of caribou and then followed the herd's movements to the calving grounds. Further data were gathered on population structure, the number of calves that successfully overwintered, response to aircraft, and behaviour when encountering seismic lines. The herd was censused in cooperation with Alaskan authorities in early summer, providing us with much more accurate population data than we had obtained from our 1971 aerial photography of the herd. We also studied calving success and the development of mother-young relationships, disturbance and mortality from various sources. This work is reported in Appendix I of our Interim Report No. 3 which is tabled with you as exhibit number 137. This work is reported in Appendix I to our Interim Report No. 3, as mentioned, along with some late season survey carried out between the Mackenzie and Anderson Rivers north of 67° in response to new and changed alignments namely to Richards Island.

The fish survey study was continued in 1972, but the efforts were stepped up considerably to cover the alignment revisions. Our two helicopter based reconnaissance crew sampled all the streams along the coastal alignment, the north Mackenzie routing, and up the valley to



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1 Fort Simpson before ice terminated the effort.

2 In addition we carried out a number of intensive  
3 studies on the Hume, Ramparts, Arctic Red and Old  
4 Crow Rivers, most of which are not now on the  
5 applicant's alignment. The results of these studies  
6 are presented as tabulated base data in Appendix II  
7 of Report No. 3.

8  
9 In May 1972 we embarked on an  
10 intensive aerial survey of the spring migration of  
11 waterfowl along the Mackenzie River and their use  
12 of river islands at that time. Ground camps  
13 were established on some islands to observe the  
14 reaction of different species to aircraft in the  
15 vicinity and other sources of disturbance such as  
16 predators. During the summer we gathered baseline  
17 data on 24 species of birds breeding in the vicinity  
18 of Moose Channel, Yukon Territories, including  
19 nesting environment, egg-laying, clutch size,  
20 hatching, post-hatching and fledging. Between June  
21 and September 1972, we made aerial and ground surveys  
22 in selected areas along the pipeline routes to gather  
23 data on the abundance and species composition in broad  
24 habitat classes, and during June through August  
25 we ran a survey of nesting raptor habitat in the  
26 Northern Richardson Mountains near Inuvik and at  
27 locations along the Mackenzie River. We wanted to  
28 determine species composition, distribution and in  
29 particular, areas of nesting abundance, the period of  
30 nest occupancy and breeding success. Finally, our  
ornithological research involved a program of fall



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1 migration watches in the Lower Mackenzie Valley at  
2 Moose Channel, Toker Point, Point Separation,  
3 Arctic Red River, Little Chicago, Fort  
4 Good Hope, and Lask Week Island. Ninety-seven  
5 watches, by eight observers, gave us numbers, species,  
6 direction of migration, and local weather.  
7 All this work is reported in Appendix III to Interim  
8 Report No. 3. One exception, however, was made in that  
9 data on raptor nesting sites has been distributed in  
10 confidence only to the Canadian Wildlife Service.

11 We continued our revegetation  
12 studies in 1972 with further sampling of sites  
13 established earlier as well as additional work at  
14 Tuktoyaktuk. The revegetation data were related  
15 to that from previous studies. Tentative seeding  
16 techniques, seed mixes and the overall effectiveness  
17 of reseeded as a means of preventing subsidence  
18 were presented in Appendix V of report 3.

19 In addition to these  
20 field research programs, we also  
21 conducted a number of office studies. We studied  
22 several potential problems of a geotechnical and  
23 hydrological nature which we had identified in  
24 Interim Report No. 2 to gain a more detailed under-  
25 standing of the terrain to be crossed by the  
26 proposed gas pipeline and to provide the inputs we  
27 needed to assess impact on terrain. Potential  
28 problems of a geotechnical nature that we  
29 studied were permafrost degradation and  
30 thaw settlement, frost heave and heaving pressure,





1 slope stability, seismicity, and soil  
2 erosion. The hydrological study effort was largely  
3 devoted to the development of a mathematical model  
4 to predict the behaviour of rivers and streams. The  
5 model drew upon previous meteorological data, although  
6 it was and still is somewhat lacking for design  
7 purposes. This model was subsequently used to  
8 predict the magnitude of increased sediment loads  
9 arising from construction disturbances within each  
10 watershed. This work is reported in Appendix IV to  
11 Interim Report No. 3. All geotechnical, geological  
12 and construction data available to us on the  
13 project up to April 1, 1973, was reviewed, compiled,  
14 and entered on maps and overlays that form the  
15 "Map Supplement" to that report, and which has also  
16 been tabled today.

17 We initiated an office study  
18 of winter roads having recognized the potential for  
19 severe terrain degradation due to the use or misuse  
20 of winter roads in the Western Arctic during construction  
21 of the proposed gas pipeline. Study effort was  
22 directed at establishing seasonal limits for winter  
23 road use that would maximize winter construction  
24 periods while keeping terrain degradation to acceptable  
25 levels. The study entailed examining pipeline  
26 route maps showing terrain, geotechnical features  
27 and vegetation; collecting meteorological records,  
28 reviewing current practices of winter road construction;  
29 and summarizing available data on vehicle types, load  
30 ranges and frequency of passes. This work together



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1 with a bibliography and abstracts of over 300  
2 scientific references forms appendix VI to Interim  
3 Report No. 3.

4 Finally, in 1972, we  
5 initiated an office study of natural and man-  
6 made fires in the western arctic and their effects  
7 on the environment. This study considered the effects  
8 that a pipeline would have on the frequency of natural  
9 fires, and also the effects of natural fires may  
10 have on construction operations. Also examined  
11 were the causes of man-made fires and how such fires  
12 can be detected, prevented and fought. This work is  
13 reported as the final Appendix, number VII of  
14 Interim Report no. 3.

15 Three additional areas which  
16 we studied were recreation, archaeological resources, and  
17 the native use of resources. This work was not reported  
18 in our interim reports, but comprises the final three  
19 chapters of Volume IV of our final impact assessment.  
20 Which is tabled as number 135 -- exhibit 135 today.

21 Our assessment of the  
22 impact of the proposed project on the outdoor recrea-  
23 tion potential of areas crossed by the route was  
24 based largely on studies of work by other  
25 recreationists' and on the authors' own evaluations.  
26 The recreation study considered factors which  
27 are increasing the demand for outdoor recreation, the  
28 advantages and disadvantages of northern areas for  
29 recreation, types of recreation available in northern  
30 areas and specific evaluation of areas where the



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1 recreation potential could be most seriously affected.

2 Our assessment of the impacts  
3 on the archaeological resources along the  
4 route was based on a review of recent archaeological  
5 studies conducted by other researchers in the Yukon  
6 and Northwest Territories. The archaeology study  
7 included a description of the aspects of the project  
8 that could cause loss of, or damage to, the  
9 archaeological resources of the various regions and  
10 the prediction of what impacts would be likely to  
11 occur. Our assessment of the impacts on the native  
12 use of resources was based largely on data and  
13 reports of other researchers in conjunction with personal  
14 communications by the author with native people in the  
15 pipeline project areas. The study considered the im-  
16 portance of the land resource to the economic well  
17 being of the native people and the potential impacts  
18 of the project on their life style.

19 This, then, comprises our  
20 major research effort both in field and office,  
21 and it brought us to a position where together  
22 with the growing body of research from other sources,  
23 we were able to prepare our final impact assessment.

24 In the summer of 1974, having  
25 completed the greater part of our impact  
26 assessment, we undertook two disturbance studies.  
27 The first study was designed to assess the response  
28 to disturbance of terrain and vegetation in the  
29 Yukon Coastal Plain and the Mackenzie Delta region.  
30 This study involved a general reconnaissance





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1 of existing disturbances along northern portions of  
2 proposed pipeline routes in the western arctic and obtain-  
3 ing all -- or obtaining soil cores and vegetation samples  
4 at five sites. The principal objectives of this  
5 study were to gain more insight into the behaviour of  
6 northern landscape units following man's activities  
7 and to evaluate both terrain and vegetation response  
8 to disturbance in detail on a few sites.  
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The study focused on surface disturbance and related frost settlement, natural stabilization of slopes, drainage disruption, and plant recovery and its effects on terrain. The report on this study was completed in March, 1975.

The second study assessed the effects of construction on stream environments in Northwestern Canada. The objectives of this study were to use disturbances to calibrate and further understand the impact assessments which had been previously made on the basis of office studies. The report of this study is not yet available, as we have only recently received a draft from the researchers.

I should mention also that a special visit in conjunction with this work was made to the native communities of the Mackenzie Valley in September of 1973. The visiting team was comprised of three of the Board members and two staff members, and meetings were held at four centres from Fort McPherson to Hay River, and with representation from most of the communities - I think only two were unable to make it because of weather reasons, and represented both the large and small communities in that general area.

Also a special reconnaissance by two Board and two staff members was made of the Alaska Highway from the Alaskan border to Fort St. John. It was undertaken in September of 1974. The purpose in this case was to investigate visually the



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1  
2 impact of that major project some 30 years after first  
3 construction.

4 I'd like to deal now, sir,  
5 with the roles of the Environment Board that I've  
6 mentioned. We see that the Board had a dual role.  
7 The first was an advisory role to the sponsors to  
8 advise them on ways and means for protecting the  
9 environment by incorporating environmental considera-  
10 tions into route planning, pipeline design, and con-  
11 struction specifications, and by training construction  
12 workers in environmental protection.

13 An external or public role  
14 in which the Board was to prepare and publish its  
15 data, findings, and recommendations, plus an impact  
16 assessment without prior editing or control by the  
17 sponsor. The Board, as conceived initially, was also  
18 to monitor the construction work to see that its  
19 recommendations were followed and to conduct a post-  
20 construction evaluation of the actual environmental  
21 impact so it could be compared with the earlier pre-  
22 dictions.

23 First of all, in relation to  
24 the sponsor-advisory role, first I'd like to talk about  
25 this aspect of it, since its first meeting in December,  
26 1970, the Board has had 37 meetings. At over 20 of these  
27 meetings a representative or representatives from the  
28 sponsor were present. Several Board members and  
29 their support staff participated in the week-long  
30 engineering and environmental review meeting from



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1  
2 April 9th to 13th, 1973, which was convened by  
3 Canadian Arctic Gas Study Limited. This meeting was  
4 significant in that it provided a forum for the free  
5 expression of concerns about areas along the then  
6 proposed routes. As well, the chairman of the Board  
7 frequently attended meetings of Arctic Gas Environmental  
8 Advisory Committee, which consisted of representatives  
9 from each of the firms in the Arctic Gas consortium.

10 In addition, there were many  
11 other formal and informal occasions over the years  
12 of the Board's operations, where the Board provided  
13 advice and raised their concerns to the sponsor. One  
14 specific example of this advise is the preparation of  
15 the report,

16 "Guidelines for Environmental Training of  
17 Pipeline Construction Workers, "  
18 in July, 1973. This report sets forth specific guide-  
19 lines for the development of a program, presents a  
20 proposed environmental training system for project  
21 workers, and a proposed organizational structure for  
22 the development and execution of this training system.

23 If I can now deal with the  
24 external role of the Board. The Board has published  
25 three interim reports, and environmental impact  
26 assessment, both of which have been tabled here today,  
27 sir, 27 newsletters in English, and 11 in French, and  
28 8 brochures. It has conducted one workshop and  
29 published its proceedings, and it has prepared three  
30 papers for one other particular conference, and there





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1  
2 have been other papers presented at other conferences  
3 individually.

4 Interim report No. 1, tabled  
5 as Exhibit 139, was published in November, 1971. In  
6 the first interim report the Board presented an apprai-  
7 sal of the effects of the construction and operation  
8 of the gas pipeline on various components of the  
9 natural environment, and indicated the potential for  
10 certain adverse effects from such construction and  
11 operation. Interim report No. 1 comprised six  
12 volumes. The report proper, which represents the Board's  
13 interim assessment, four supporting appendices on  
14 wildlife, fish, vegetation and re-vegetation, and an  
15 addendum to the vegetation appendix.

16 Interim report No. 2, filed  
17 as Exhibit No. 138 today, is a one-volume report  
18 dealing with the possible effects of pipeline engineer-  
19 ing design on the environment, as well as with the  
20 impacts of those effects. The report also posed a  
21 series of questions for the pipeline designer to draw  
22 attention to those aspects of engineering design that  
23 can have adverse effects on the environment.

24 Interim report No.3, tabled  
25 as Exhibit No. 137, was published in March, 1973.  
26 Since 1971 the Board had gathered base line data for  
27 assessing the potential environmental impact along  
28 major northern portions of the proposed gas pipeline.  
29 Major areas of concern were caribou, birds, other  
30 wildlife, fish, superficial materials and permafrost,



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2 water, re-vegetation, winter roads, fire, and  
3 training of construction personnel. Interim report  
4 No. 3 summarized findings in these areas of concern  
5 and offered some preliminary recommendations for  
6 eliminating or ameliorating the impact of pipeline  
7 construction and operation on the environment. The  
8 interim report No. 3 referred to was comprised of  
9 10 volumes.

10 Our final impact assessment  
11 which is tabled today as Exhibit No. 135, was published  
12 in September, 1974. This report is the Environment  
13 Protection Board's impact assessment of the portion of  
14 the proposed Mackenzie Gas Pipeline in the Yukon and  
15 Northwest Territories with some comments on the proposed  
16 Alaska section. It represents the culmination of four  
17 years of study involving field investigation of the  
18 major environmental components and analysis of the  
19 requirements fo\_r regulating this enormous project.  
20 The purpose of the report is not only to help determine  
21 whether or not the proposed Mackenzie Gas Pipeline from  
22 Alaska to Alberta should be built, but more important,  
23 to achieve environmental protection in the event that  
24 it is built.

25 The final report comprises  
26 of four volumes, referred to earlier by the chairman  
27 of the Environment Board.

28 Through a series of questions  
29 and answers, Volume 1, the Board's opinion presents  
30 a summary of the Board's impact predictions along with



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1  
2 some of the limitations to which they are subject.  
3 The existing framework for environmental protection,  
4 recommendations for achieving environmental protection,  
5 and a general conclusion.

6 Volume 2, entitled:

7 "Towards an Environmental Code",  
8 is similar in style to a construction code. It spells  
9 out the performance levels required of the applicant  
10 and the government which the Board believes will limit  
11 the impact of this project on the environment to an  
12 acceptable level.

13 Volume 3, entitled:

14 "Environmental Atlas,"  
15 is an impact assessment in graphic form which has been  
16 commented on here earlier today by the chairman.

17 Volume 4, entitled:

18 "Research Report,"  
19 lays the groundwork for the first three volumes of the  
20 assessment. It comprises 11 scientific reports present-  
21 ing the results of studies carried out for the  
22 Environment Protection Board. Each chapter reports the  
23 research conducted on one aspect of the environment --  
24 terrain, winter roads, vegetation, mammals, caribou,  
25 birds, water, fish, recreation, archeology, and native  
26 use of resources, and each presents an assessment of  
27 impact on that component and recommendations to  
28 alleviate that impact.

29 The Board sponsored a two-day  
30 workshop on the philosophy of environmental impact





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assessments in Canada, on September -- in September  
1973 in Winnipeg, and published the proceedings of this  
workshop.

I wonder, sir, if I could  
since it hasn't been tabled at this point, table this  
report--

THE COMMISSIONER: Certainly.

A On the workshop.

(WORKSHOP REPORT MARKED EXHIBIT 140)

A The workshop was held  
to examine the philosophy of impact assessments in  
general and their desirability for and applicability  
to the Canadian scene. The Board also had major  
inputs into the National Conference on Environmental  
Impact Assessment, Philosophy & Methodology, sponsored  
by the Agassiz Centre for Water Studies at the  
University of Manitoba, held in November, 1973 in  
Winnipeg. The Board presented a detailed case history  
outlining its approach to impact assessment.



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1  
2 Eight brochures were published  
3 by the Board over a 4-year period. They were published  
4 to bring the results of our research to a much wider  
5 audience than that reached by detailed scientific  
6 reports. The content of each brochure was an accurate  
7 digest of the research findings suitably illustrated  
8 by maps and photographs to give its readers a vivid  
9 understanding of the subject matter. The brochures have  
10 dealt with some of the main concerns for the northern  
11 environment and how the environment could be affected  
12 by the proposed pipeline.

13 I wonder here, sir, if I  
14 could table these eight brochures, as well, which  
15 haven't been put into evidence at this point?

16 THE COMMISSIONER: Yes.

17 A The first, published in  
18 1971, was entitled:

19 "What about the Environment?"

20 This was followed in 1972 by

21 "What about the Caribou?"

22 And

23 "What ABout the Fishes?"

24 In 1973,

25 "What about the Permafrost?"

26 and "What about the Birds"

27 was published.

28 "What about the Vegetation?"

29 and "What about the Vegetation Damage and Recovery?"

30 and finally,



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"What will be the Environmental Impact?"

All of these followed in 1974.

(SET OF BROCHURES MARKED EXHIBIT 140 )

The response we have received from all sectors for these brochures has necessitated several re-printings, bringing the number of some brochures in circulation up to 8,000.

Newsletters deal selectively with specific environmental topics under consideration by the Board, published generally on a monthly basis, they were intended to keep persons at various levels of government, those interested purely in conservation, and other interested parties informed of the Board's activities and afford them an opportunity of having their views made known to the Board. From February, 1971 to date, 27 newsletters have been published, ranging from an introduction to the Board, constructors' attitudes, northern energy transport, the railway alternative, and the unpredictability of caribou migration. Since May 1973 these newsletters have also been published in French.

I wonder, sir, if I might also table copies of those newsletters at this time and this includes in it the -- what was referred to earlier, response to the expanded guidelines for northern pipelines, it was included in a newsletter form.

(NEWSLETTER MARKED EXHIBIT 141)

The Board's reports, brochures,



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2 newsletters, and workshop proceedings have been dis-  
3 tributed to Federal, Provincial, Territorial, Local and  
4 U.S. Government officials, to university faculty members,  
5 to major government, university, and public libraries,  
6 to various associations and organizations and to various  
7 people in industry. Over 600 copies of the Board's  
8 impact assessment have also been distributed.

9                   The Board receives a great  
10 many requests each week, both for its publications and  
11 for information relating to the work which has been  
12 done. Part of our public role is in co-operative  
13 research. In September, 1971-1972, support staff  
14 co-operated with Canadian Wildlife Service personnel  
15 in a caribou tagging program in the Porcupine River.  
16 They also co-operated with Alaskan biologists from the  
17 U.S. Fish & Wildlife Service in June, 1972, in conduct-  
18 ing a post-calving census of the Porcupine caribou  
19 herd.

20                   Another area of co-operative  
21 research was in studies on birds. Our staff co-operated  
22 with the Canadian Wildlife Service personnel in snow  
23 geese surveys and in monitoring fall migration along  
24 the Mackenzie Valley in 1972.

25                   A final area of the public  
26 role of the Board concerns the participation of Board  
27 members and their support staff in numerous conferences  
28 and seminars on aspects of northern work and various  
29 other topics.

30                   Mr Commissioner, my final





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1  
2 submission at this point is on -- is to outline to  
3 you the funding and cost of the operation of the Envir-  
4 onment Protection Board., and unless Mr. Templeton has  
5 any further comments at this point, I'll proceed on  
6 directly with that.

7 The concept that we believe  
8 is unique to the Board is that while its primary  
9 objective is achieving environmental protection, it  
10 is funded by a gas pipeline consortium and yet maintains  
11 autonomy in working towards the achievement of its  
12 objective. It may be assumed that no government or  
13 industry lightly surrenders control over that which it  
14 funds. It is an easy assumption by many that no Board  
15 is autonomous if industry pays the bills. Yet this  
16 unique arrangement has existed since September, 1970,  
17 and it has involved basically three different sponsors  
18 since its beginnings at that time, and the last of  
19 the three is the present applicant, Canadian Arctic  
20 Gas Study Limited.

21 Since its inception this  
22 Board has submitted annual budgets to its sponsor and  
23 long-range budgets to carry on its work throughout the  
24 construction and post-construction phases of the  
25 project. Each request for funding was accompanied  
26 by a general outline of the work the Board intended to  
27 carry out in the coming year. Following meetings with  
28 the sponsors and in latter years with environmental  
29 committees of the sponsor, a level of funding was  
30 approved. Since the Board began operating, it has



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1  
2 adhered to the principle that to make its operation  
3 effective it must be in a position to decide what  
4 research is required in order to prepare its impact  
5 assessment. While some of this research would include  
6 a review of the work of others, the Board has always  
7 decided how best to allocate its limited financial  
8 resources. Accordingly, when the Board receives a  
9 level of funding following representation to the  
10 sponsoring group, the Board then allocated these  
11 funds to various field and office studies. The Board  
12 also allocates funds to the preparation, publication,  
13 and distribution of its reports, brochures, and news-  
14 letters so that its findings would become public.

15 In our report, "A re-evaluation  
16 of the role of the Environment Protection Board" which  
17 we submitted to Gas Arctic Systems in March, 1972,  
18 when they assumed sponsorship of the Board from Alberta  
19 Gas Trunk Line Co. Ltd., we pointed <sup>out that</sup> / the Board should  
20 be kept informed of research activities and programs  
21 so that we could comment on or review them if required.  
22 We would then proceed to terminate within a reasonable  
23 time all commitments which related to our activities.  
24 At the same time, had the Board considered that the  
25 limits imposed by the sponsor, on either the budgets  
26 or programs, were such as to jeopardize the work of  
27 the Board or its ability to produce a proper impact  
28 assessment, we could terminate the arrangements within  
29 a reasonable time. This general arrangement has been  
30 carried forward in our relationship with Canadian



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Arctic Gas Study Limited.

The administrative vehicle for carrying out the Board's requirements was Interdisciplinary Systems Ltd. of Winnipeg, a subsidiary of Templeton Engineering Company. Its role included providing the secretariat for the Board, administering research requirements either through in-house or contracted staff, the preparation of all publication materials, and all other administrative requirements.

In the first 16 months to December 1971, the Board received funding of \$400,000. In 1972 and 1973, this increased to \$880,000, in each year and in 1974 with the preparation, publication and distribution of our impact assessment, we received funding of \$700,000. This year, <sup>1975</sup> funding has been reduced to \$145,000. Our total funding has thus been \$3.4 million.

MR. Commissioner, that completes my presentation at this time.

WITNESS TEMPLETON: Mr. Commissioner, we are now at a new section of our presentation, and these are, What are the Environmental Impacts in which all the Board members will participate; but first by way of introduction, the predictions, accuracy and limitations were mentioned before, but I don't think it can be said too often, but everyone who has prepared an environmental impact assessment has difficulty in expressing the impact. How do you express it? In what terms do





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1  
2 you express it? It would be nice if there were a common  
3 unit of measurement such as a dollar so that you could  
4 express positive or negative values and arrive at a  
5 definite numerical conclusion. Some people feel that the  
6 benefit-cost system of analysis could and should be used,  
7 but this system uses dollars as a unit of measurement.  
8 We do not agree that things such as wilderness, rare,  
9 and endangered species, archeological resources and the  
10 such like can have a dollar value placed on them. The  
11 value of the 1975 dollar is as fleeting as the \$5 treaty  
12 money of the 1800's.

THE COMMISSIONER: I thought it  
was the 1900's. This was discussed in Hay River.

14 A It's therefore necessary  
15 to express impact in subjective terms, and about the best  
16 you can do is say the impact will be severe, moderate,  
17 or minor. This we have done in the matrix which you have  
18 already seen.  
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1 In writing a report on  
2 environmental impact, one should really use an eco-  
3 system approach, and by that we mean you discuss the  
4 environment of a region, and we will say the coastal  
5 plain, as a complete system comprising of fresh water  
6 aquatic system, salt water aquatic system,  
7 marine and land plant system, birds, mammals,  
8 terrain, etc., and the interaction of each system with  
9 the others and how the project would alter it, but  
10 when you start to enumerate those as was shown in  
11 the matrix earlier, it is easy to see that this would  
12 soon get beyond the scope of a mind as small as  
13 mine which can't even understand legal terms let alone  
14 an ecosystem.

15 From our report we presented  
16 the impact in not an ecosystem, but under twelve  
17 headings and we tried to consider the components  
18 together and their impacts on each other and to  
19 the limit of our ability secondary and tertiary  
20 effects, but we did that in the matrices but  
21 for clarity of presentation, we presented the  
22 report as answers to twelve questions and these  
23 questions were regarding:

24 Impact on the limited supply of land in its  
25 natural state;

26 The Impact on northern peoples;

27 The impact on birds;

28 The impact on mammals;

29 The impact on fishes;

30 The impact on vegetation;



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1 The impact on archaeological resources;

2 The impact on air;

3 The impact on water;

4 The impact on terrain;

5 And then the last two headings that we treated were  
6 the total impact of all of these other impacts and  
7 the cumulative impact of this and other  
8 projects that will follow it. These last two are  
9 at the end of the list not because they are the  
10 least important, but because they sum up the others.

11 For the sake of our pre-  
12 sentation today, we have combined some of the  
13 categories that are related, such as fish and  
14 water, for example, but before we go into these I  
15 would like to discuss some of the restrictions we  
16 imposed upon ourselves in our assessment, and some  
17 of the limitations that apply to our predictions.  
18 First, our self-imposed restrictions.

19 We have restricted our  
20 assessment to the possible effects on the northern  
21 natural environment of the trunkline proper and not  
22 to the possible effects of peripheral facilities  
23 or activities such as petroleum exploration and gas  
24 gathering systems and treatment systems. We did,  
25 however, include the peripheral activities of the  
26 pipeline companies such as borrow pits and access  
27 roads and wharves and things like that.

28 We also, we have not assessed  
29 the social or economic justification of the pipeline  
30 for Canada nor the effects of the pipeline investment in



1 Canada.

2 We have assessed effects  
3 on native people only insofar as they are users of  
4 the biological resources. Since a change in these  
5 resources would affect the ability of the people  
6 to use them and relate to them in their natural  
7 culture -- or in their culture, I am sorry, -- not  
8 natural culture. We have not examined the social  
9 and economic ramifications of the construction and  
10 operations of the proposed pipeline. Such aspects  
11 as the effects of a massive influx of construction  
12 workers into the north or the effect on the cost  
13 of living construction would have on the  
14 demand for goods and services were not within  
15 our scope.

16 We have addressed  
17 several environmentally related aspects (Archaeology,  
18 aesthetics, and recreation) in our impact assessment  
19 because they felt they were a logical part of our  
20 work. These investigations however, did not involve  
21 any actual field research. Instead, they were general  
22 office appraisals. They were not prepared by  
23 specialists in these subject areas.

24 I should emphasize that we  
25 are not commenting on the proposed route revision  
26 east of Fort Simpson nor the cross delta alternate  
27 route which has come up at a number of ~~these~~ hearings.  
28 We are opposed to drawing conclusions about ~~these~~  
29 alternatives at this time. This opposition is in  
30 keeping with the principle that no route revision





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1 be considered without adequate information on the  
2 project description, without adequate information on  
3 the environment, and without sufficient time being  
4 provided for a thorough evaluation of impact.

5 We have addressed both the  
6 Coastal and Interior Alternatives, alternate routes,  
7 but these have been proposed for some time and both  
8 have been studied.

9 There are two concerns regarding  
10 the comparison of the interior and coastal routes  
11 which are only partly resolved. These have to do  
12 with the probable or possible location of future gas  
13 discoveries west of the Mackenzie Delta and also  
14 the fact that our studies stopped at the Alaska  
15 border as required by our terms of reference, although  
16 the environment does not stop there.

17 Now, about the limitations of  
18 our environmental impact predictions. The predictions  
19 depend upon the assumptions made as to the  
20 type of operation, the time of the year the pipeline  
21 would be built, the controls, the supervision of the  
22 people working on the project, the regulation of the  
23 project by government and the accountability of the  
24 applicant and the Government to the public for limiting  
25 of environmental change.

26 The accuracy of our predic-  
27 tions is limited for several reasons, among them  
28 being the inadequacy of base-line data, the shortness  
29 of the time over which the observations have been made,  
30 the complexity of the environment, and the unpredic-



1       tability of all personnel associated with the  
2       project. Only the most and direct effects of the  
3       project can be predicted with any degree of  
4       accuracy.

5                       The required restrictions  
6       on various project activities as they  
7       affect each component of the environment are spelled  
8       out in some detail in each chapter of Volume V of our  
9       report for those who wish to read it. For example,  
10      we have assumed that the applicant would be required  
11      to observe fairly rigid seasonal restrictions  
12      on the use of winter roads. We therefore concluded  
13      that the impact from the use of winter roads would be  
14      minimal. However, if the applicant were not required  
15      to observe restrictions, or simply did not do so, the  
16      resulting impact would be severe.

17                      Now, perhaps we can go on  
18      to discuss the groups of impacts, the use of the  
19      matrices, the examples of local impacts, the criteria  
20      we used to predict impact, and our conclusion as to the  
21      impacts on those components of the environment that we  
22      singled out.

23                      Dr. Adam will now discuss the  
24      impact on terrain.

25                      THE COMMISSIONER: Before  
26      you begin, Dr. Adam, can I just ask a question, Mr.  
27      Templeton, before you leave the matter that you have  
28      been discussing. You said that you considered  
29              cumulative impact, that is the last heading under  
30      which you examined the question of environmental impact.



1 If you are not in a position to tell me now, don't  
2 feel obliged to, but it has come out here at  
3 these hearings that there is a real likelihood that  
4 the line, the trunk pipeline will be looped and  
5 that the looping will begin within four years of  
6 the pipe being laid from the Mackenzie Delta south,  
7 and the looping, we are told, will involve essentially  
8 the construction of a second gas pipeline, that will  
9 take three years and then the installation of additional  
10 compression will take two more years, so that  
11 if you take merely the laying of pipe itself, this  
12 is a project that may well take ten or twelve  
13 years.

14 The pipeline guidelines  
15 which Mr. Craik referred to and which part of the  
16 terms of reference of this Inquiry, proceed on the  
17 assumption that if a gas pipeline is built, an oil  
18 pipeline will likely follow and along the same route,  
19 so that you have then an obligation resting on  
20 this Inquiry to consider not only the initial trunk  
21 pipeline to transport gas, but as well the building  
22 of a second gas pipeline which Mr. Horte, the president  
23 of Arctic Gas, very fairly and straightforwardly  
24 conceded was a real likelihood, and then you have  
25 what the Government of Canada, in laying down the  
26 pipeline guidelines regarded as the real likelihood  
27 of an oil pipeline being built, all along the same  
28 route. I am really reciting this at great length  
29 for the benefit of your colleagues and maybe that is  
30 unnecessary too, but I know you were here when it  
was discussed.





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1  
2 A No, I think I am glad  
3 you did.

4 Q Well, under the heading  
5 "Accumulative Impact" you and your colleagues, if you  
6 haven't done so already, if you feel you can, take a  
7 look at cumulative impact in the light of what I have  
8 said.

9 That's merely an invitation  
10 and if you feel inclined to accept it, go ahead and do  
11 so whenever it is appropriate during your presentation.

12 A I certainly was  
13 concerned about that, when I heard Mr. Horte explain  
14 that because I didn't realize that the looping was  
15 going to come up anything like as soon as was related in  
16 the hearings last week, or the week before.

17 I think though, this  
18 cumulative impact is a very difficult one because it  
19 applies not only to those things you mentioned, but a  
20 lot of other activities like increased recreational use,  
21 and stores and all sorts of activities that automatically  
22 follow.

23 And the problem you  
24 have in any of these things is to say, what really am  
25 I looking at? Am I looking at this project, or am I  
26 looking five years down the road, or a hundred years?  
27 And this is a very difficult thing to address yourself  
28 to. And also are you -- times and needs and knowledge  
29 changes and so do the resources, and I think you have to  
30 look at these additional things that follow, and I am



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1  
2 sure that the Board hasn't discussed these, but it is  
3 an interesting thing as to what do you consider the  
4 looping of this pipeline part of the project or the next  
5 project. Well, we draw the line on say the two, the  
6 Simpson relocation and the Cross-Delta route, and say  
7 that's a different project at this time.

8 We don't want to discuss it  
9 until we have had a chance to assess it. I think that  
10 this is where you always have trouble in trying to  
11 define you project when you know that some things are  
12 going to follow. I found a great deal of difficulty  
13 with the Land-Use Regulations, and we spent quite a  
14 little time in responding to them, which I think is  
15 contained in one of the Response to the Guidelines that  
16 Mr. Craik put in evidence in in one of our newsletters.

17 Because we weren't ready to  
18 accept the idea that the oil pipeline, a highway, the  
19 powerlines, and possibly a hydro development in the  
20 Bear River, inevitably followed. Some of these you  
21 have to say, "well, I can do the best-- I'm only going  
22 to do the best I can on this project," and hope that the  
23 next group are going to somewhere along the line define  
24 how far they are going to go.

25 It's not an easy thing, but  
26 we will try to develop this, in particular we are going  
27 to discusee the need for a land-use plan in the Western  
28 Arctic. Dr. Ian McTaggart-Cowan will talk about the  
29 cumulative effect, but it isn't going as far, I don't  
30 believe as you've suggested, but we will take that back



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1  
2 and see if we can't address that in a little more  
3 definitive fashion than I can do today.

4 Q Well, let me put it  
5 this way. The project, as outlined to us in great detail  
6 is a three year pipe laying project, with pipe laying  
7 scheduled to begin in 1978, the winter of 1978.

8 The looping of that  
9 pipeline, in light of the evidence we have heard, is  
10 obviously an integral part of the whole project to bring  
11 gas from Prudhoe Bay and Mackenzie Delta, to markets  
12 in southern Canada and the United States.

13 I am not asking you  
14 to agree with me or disagree with me, I am simply telling  
15 you what -- how I look at it. That will mean that when  
16 looping occurs you will have as much pipe brought in  
17 as you needed to lay the original pipe. You won't of  
18 course, have to establish your infra-structure because  
19 it will presumably still be there. So the impact in  
20 some ways will be less, but in some ways <sup>will</sup> be just as  
21 great as it was when you laid the first pipe.

22 Now, those two things,  
23 the first pipe and the second pipe seem to me to be  
24 part of one project. But under the pipeline Guidelines,  
25 I am bound to consider the impact of an oil pipeline  
26 because the government of Canada in the Expanded Guidelines  
27 has said that the choice of a route for a gas pipeline  
28 will likely, will inevitably have a great influence on  
29 the choice of a route for an oil pipeline. So that the  
30 Inquiry has to go into that.



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1  
2 Now, I am not asking  
3 you and your colleagues at this stage to think about a  
4 railway or a hydro-electric power development on Great  
5 Bear Lake, and you have already excluded the enhanced  
6 oil and gas exploration activity that might occur if  
7 the pipeline were built. You've excluded the gas  
8 gathering facilities that would be built and the gas  
9 plants; I can understand that you want to draw the line  
10 somewhere, but since that second gas pipeline would be  
11 built alongside the first one, and since the assumption  
12 in the Pipeline Guidelines is that an oil pipeline would  
13 follow the same route, you and your colleagues might  
14 want to consider those matters

15 If you are in no  
16 position to give any opinion at all during this current  
17 visit to Yellowknife, you might want to give it some  
18 thought at a later date, and we might have the benefit  
19 of your views then. You and your colleagues are men  
20 of great distinction in your fields, and I need all the  
21 help I can get, let me put it that way. So you might  
22 reflect on that if you wouldn't mind.

23 A We will try to do that.  
24 Perhaps we can have a preliminary discussion of it, on  
25 Wednesday, and then perhaps go back and do some more  
26 on it and come back at a later date.

27 THE COMMISSIONER: Well, I  
28 am sorry Dr. Adam, forgive me for interrupting.

29 WITNESS ADAM: The topic  
30 I will address is terrain.





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1  
2 We consider the impact  
3 of this project on terrain to be potentially one of the  
4 most significant of all the impacts we have considered.

5 The word "terrain" as  
6 I will be using it refers to the physical features of  
7 a tract of land with particular emphasis on surface and  
8 slope stability. However, in general it includes all  
9 landscape surface features and therefore, it is not  
10 easy to keep it separate from concerns relating to  
11 vegetation, water, land in its natural state and even  
12 aesthetics.

13 We chose surface stability  
14 and slope stability as indicators for predicting the  
15 impact on terrain from this project. We then sought  
16 definitions of measurable impact for these indicators.

17 For surface stability, we  
18 decided that a moderate impact would occur when more  
19 than 5 percent of the length of any road or pipeline  
20 right-of-way undergoes noticeable settlement. And a  
21 major impact would occur when more than 5 percent of the  
22 length of any road or right-of-way settled to form  
23 depressions over 2 feet deep.

24 For slope stability, moderate  
25 impact occurs when slopes or slides increase by 0.1 to  
26 0.2 per mile of pipeline; that is, one or two every 10  
27 miles. At present, there is normally one instability in  
28 10 miles. A major impact is when instabilities increase  
29 more than 0.2 instabilities per mile; that is, more  
30 than two additional instabilities in 10 miles. Frost



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1  
2 heave, drainage disruption and winter roads are the  
3 other impacts we consider as relating directly to terrain.

4 The potential interaction  
5 of pre-construction, construction, and operation activities  
6 of the proposed project with terrain results at points  
7 of contact at the ground surface. Construction equipment  
8 engineering works, and concentrated activities are the  
9 main sources of inter-action with terrain.  
10  
11  
12  
13  
14  
15  
16  
17  
18  
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21  
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28  
29  
30



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This slide shows the full potential inter-action matrix with arrows pointing to the inter-action between terrain and clearing, grading and burning activities on the project.

This shortened version of the matrix shows this inter-action more clearly indicating care must be taken when clearing, burning and grading are carried out. Construction equipment during clearing has a moderate potential for inter-action with the ground surface, providing clearing is carried out in the winter and sufficient snow cover exists. On the other hand, conventional grading of the ground surface on the right-of-way has an unavoidable severe potential impact on terrain since severe surface disturbance will result from conventional grading, particularly in ice-rich areas. Burning slash on the surface has a severe potential impact through surface disturbance, although by removing the contact point by the use of burning sleighs, the potential for impact is much reduced.

The physical presence of buildings and other engineering works has a moderate affect on terrain, provided good engineering practice is followed.

This slide shows the full potential inter-action matrix with the arrows pointing to the inter-action between terrain and the presence of various project facilities. This shortened version shows this inter-action more clearly. In addition,





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1  
2 where borrow pits are to be located, impact on terrain  
3 will be severe. Pipeline installation also has  
4 severe potential impact on terrain due to ditching,  
5 spoil piles and mound and ditch mounds. Ditching and  
6 spoil cannot be avoided with conventional buried  
7 pipeline techniques, and the ditch mound effects can  
8 only be alleviated by providing cross-drainage works,  
9 or by hauling excess spoil. The latter solution is  
10 impractical, and cross-drainage works might be also.

11 River crossings pose a moderate  
12 inter-action due to clearing of the heavily wooded  
13 areas common along the rivers and streams. But more  
14 importantly, any cut grading on steep banks poses a  
15 severe inter-action for both terrain, surface stability,  
16 and slope stability. Crossing streams or rivers with  
17 vehicles produces a severe inter-action with surface  
18 stability, and a moderate inter-action with slope  
19 stability since slides might be induced through the  
20 surface disturbance.

21 Road transport along the  
22 right-of-way has a severe potential inter-action with  
23 the surface; where winter roads are used properly, this  
24 potential can be reduced to a moderate inter-action.  
25 Slope stability might also be moderately affected by  
26 right-of-way traffic.

27 During operation of the  
28 pipeline some of the above potential inter-actions  
29 will still exist, but probably the greatest potential  
30 inter-action with terrain will occur if a pipeline



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1  
2 rupture occurs in the late spring or early summer.  
3 On-schedule maintenance would probably necessitate  
4 crossing rivers and also necessitate traffic along  
5 portions of the right-of-way, both of which would have  
6 severe effects on terrain.

7 The probable regional impact  
8 matrix shows that the major negative impacts on  
9 terrain based on surface and slope stability can be  
10 expected in all regions except the South Mackenzie  
11 Region. You'll notice that there is no arrow pointing  
12 on the extreme right-hand column, and that is the  
13 region south of Norman Wells. But even as far south  
14 as the Willow Lake River the potential for major terrain  
15 disturbance exists. The most severe impact is antici-  
16 pated to result from cut banks at river crossings  
17 during construction, and from pipeline rupture and  
18 on-schedule maintenance during operation. From ter-  
19 rain considerations alone, the probable regional  
20 impact matrix shows some preference for the interior  
21 route over the coastal route.

22 This results from the belief  
23 that cuts would heal faster on the interior route  
24 due to the generally thicker peat layer and somewhat  
25 lower ice content soils. Terrain reaction to dis-  
26 turbance depends on the properties of the terrain, the  
27 time of year, the intensity of the activity, and the  
28 time since initial disturbance. Terrain surface dis-  
29 turbance primarily leads to permafrost degradation.

30 The sensitivity of terrain ,



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1  
2 that is a measure of the possible reaction of the  
3 terrain to disturbance, is governed by vegetation,  
4 peat thickness, ice content, slope, and soil type.  
5 The time of year of disturbance is a critical factor  
6 determining the level of disturbance of the peat layer,  
7 and also the reaction of the terrain. IN winter,  
8 with frozen ground, much less compaction or mechanical  
9 damage results than with unfrozen ground. In summer,  
10 even one pass of a single vehicle may result in perma-  
11 frost degradation and ground subsidence. Intensity of  
12 traffic ranging from a single pass to multiple passes  
13 of heavy vehicles can lead to reduction of the vege-  
14 tative cover, compression of the peat layer, and  
15 ultimately to damage and removal of the peat layer.

16 The time since initial dis-  
17 turbance is an important factor in assessing the ter-  
18 rain reaction to disturbance. The time dependency on  
19 permafrost degradation indicates that observations  
20 for a short period may not apply to the long-term  
21 effects. A typical impact resulting from terrain  
22 degradation is shown in this slide. South of latitude  
23 63 near Wrigley, little terrain degradation and some  
24 local slumping may be expected to result from the  
25 project, except at locations where the mineral soil  
26 is exposed on slopes. In such locations, mechanical  
27 erosion would be of concern, but it could be reduced  
28 by re-vegetation.

29 THE COMMISSIONER: South of  
30 what?





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A It could be reduced by  
re-vegetation.

WITNESS TEMPLETON: South of  
where?

WITNESS ADAM: South of 63.  
Now, that's in the area of Norman Wells south.

THE COMMISSIONER: Yes.

WITNESS ADAM: Now, north of  
63, clearing operations in the boreal forests and  
forest tundra regions will, in the long run, lead to  
subsidence of the cleared surface by about 1 to 1 1/2  
feet, with local slumping as deep of three feet. In  
the tundra, however, clearing operations alone where  
necessary are unlikely to cause noticeable terrain  
degradation. Cut-grading will lead to thermokarst  
subsidence, slumping, and gullyng. Where cut-grading  
is essential, it is recommended that peat be replaced  
on the exposed mineral soil to reduce the rate of  
thaw and hence reduce slumping. At river crossings,  
it is recommended that cut banks and ice-rich soil be  
armored with a layer of insulation and/or granular  
material to prevent slow -- excuse me, flow of the  
thawed material into rivers.

Icings on roads are antici-  
pated to be localized because of the small sections  
of proposed permanent roads that intersect drainage  
patterns. This icing problem, where identified, can  
be solved by the use of icing control measures in  
most cases. At river crossings it is not presently





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possible to quantitatively predict the occurrence of river icings. However, based on the understanding of the mechanism of icing formation, the operation of a chilled gas pipeline buried in the river bed does create a condition favorable for river icing. The intensified river icing activities can be anticipated at river crossings north of the Ochre River. The severity and effects of the river icing problem at each river crossing is, however, not possible to predict.

In permafrost areas, the chilled pipeline will essentially raise the permafrost table above the pipeline. This can cause ponding and re-direction of drainage in areas where the pipeline crosses natural drainage patterns. One such area extends from Fort Norman to Fort Good Hope. The ponding of water can lead to thermokarst development and re-direction of drainage can lead to instability on slopes. A typical impact resulting from drainage disruption is shown in this next slide.

Could I have the lights now, please?

In the discontinuous permafrost zone, or in areas with no permafrost the chilled pipeline can block and re-direct drainage of ground water at great depths. The blockage or re-direction of drainage can initiate fresh instability. Areas south of the Willow Lake River is likely to be severely affected. The following are possible methods for



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reducing or circumventing potential impact of drainage disruption.

1. In water courses where aquatic life may be affected by river rising, a monitoring program could be set up for wide rivers for low banks to ensure that if the river freezes to the bottom, immediate measures can be taken to minimize the effects. For small rivers with steep banks, a possible solution could be to design for overhead crossings instead of burial in the river bed.

2. In the area south of the Willow Lake River the operation of the pipeline at a temperature slightly above freezing will more or less eliminate the problem of drainage disruption. In this area the operation at above freezing temperature could cause degradation of permafrost, but because of the generally low ice content soils in that area, noticeable settlement would be localized. Frost heave and heaving pressure are problems of concern to the Board. The operation of a chilled gas pipeline in the discontinuous permafrost zone will result in differential heave that could lead to damage or rupture of the pipe. Pipeline damage or rupture could entail substantial loss in revenues and severe damage to the environment. Therefore, in areas where there is a strong or even moderate potential for a heave problem, solutions that may initially marginally more costly in order to provide a safeguard to the environment could eventually turn out to be also more economical. Such areas have been



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identified and possible solutions have also been  
suggested.





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1 Areas with potential  
2 for detrimental frost heave are located mostly  
3 south of the Willowlake River. Some small areas  
4 between Great Bear River and Willowlake River are  
5 also anticipated to result in severe frost heave  
6 problems.

7 In areas south of Willowlake  
8 River, a possible solution to the heave problem would be  
9 to operate the pipeline at a temperature slightly above  
10 freezing. Such operation would lead to permafrost  
11 degradation; but again because of the generally  
12 low ice content soils in the area, little terrain  
13 reaction would result.

14 Slope stability is another  
15 source of impact of great concern. With the data  
16 presently available to us on slope geometry, soil  
17 strength parameters, and failure modes, it is not possible  
18 to estimate the safety of specific slopes likely to be  
19 traversed by the pipeline.

20 Currently, there is no way to  
21 predict either the locations or the  
22 extent of potential mudflows; it is known, however ,  
23 that their occurrence is related to high excess ice con-  
24 tent in permafrost.

25 Areas where instability is  
26 most likely to occur have been identified from  
27 rough estimates of soil parameters in areas  
28 where various forms of instability already exist.

29 Winter roads are an important  
30 part of the applicant's winter construction plan.



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1 Before winter roads can be constructed in the  
2 fall, a certain amount of cold weather and snow  
3 fall must occur. Sufficient frost is necessary to  
4 penetrate the ground to provide a solid base.  
5 Sufficient snow is necessary to fill the depressions  
6 and provide a level surface. In addition compacted  
7 snow or ice must act as a protective cover to the  
8 vegetation and ground surface. Before snow  
9 roads are trafficable though, they must be compacted  
10 to a suitable density and hardness.

11 Research we have done indicates  
12 that winter roads can be constructed to be trafficable  
13 and to withstand simulated pipeline traffic. Therefore,  
14 to predict impact, I concentrated on whether or  
15 not sufficient cold weather and snow occurred by  
16 certain dates so that winter roads and a pipeline  
17 spread could be completed before spring breakup.  
18 The criteria for setting seasonal limits on the  
19 use of winter roads in the western arctic and sub-arctic  
20 region have not been defined in the past. The  
21 season of winter road use refers to the period when  
22 a winter road remains functionable for the purposes  
23 for which it was built. The first date of possible  
24 use in the fall and the last date of possible use  
25 in the spring establish the seasonal limits of use.  
26 The criteria for establishing these dates have been  
27 determined and past weather records analysed to  
28 establish seasonal limits of winter road use during  
29 past years. Statistical analysis of these dates was  
30 then possible.



These same past weather records show that the first possible date of use of winter roads varies considerably from year to year at given points. For instance, at Hay River, where we have 67 years of data, the criteria was met on November the 10th, in 1919, but not until December the 11th, 1952. That indicates about a month of difference. At Tuk, where we have thirteen years of data, the extreme dates of first possible use of winter roads are October 27, 1970, and November the 13th, 1962. There appears to be less deviation in extremes moving north down the Mackenzie valley, but the more northerly areas would be expected to show greater extremes if a longer period of record were available.

In our assessment -- in our impact assessment, we showed that the probability of spread completion using winter roads decreased as one moves south from Fort Good Hope to Hay River. Although we realize the Applicant did not intend to use winter construction south of 65, it now appears that winter construction may be used as far south as 63. We basically agree with this procedure, but the further south winter roads are to be used to protect the terrain, the greater is the danger they





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1 will deteriorate before the spread is completed.  
2 Serious terrain damage could result from on or  
3 off right-of-way winter roads.

4 Let me illustrate this con-  
5 cern based on a statement on page 4398 and 99, Dau,  
6 Cross-examined by Mr. Veale.

7 While speaking on the subject  
8 of winter construction season, Mr. Dau stated, and I  
9 quote: "As you move farther south into the  
10 60th parallel and northern Alberta, it is  
11 compressed, and we have about mid-December to March 20th  
12 in one particular case." Unquote.

13 Now, in some years the date  
14 the winter roads should be abandoned is before  
15 March 20th based on the more northerly Hay  
16 River data. For instance in 22 out of 67 years the  
17 criteria for abandoning winter roads were met prior to  
18 March 20th.

19 THE COMMISSIONER: At  
20 Hay River?

21 A At Hay River, but the  
22 area being spoken of was even south of HAY River.

23 THE COMMISSIONER: Yes,  
24 I understand.

25 A Spring construction  
26 cut-off dates, based on winter road availability are  
27 needed all along the route particularly from Hay River  
28 to Inuvik. But regardless of the stated cut-off date,  
29 someone must have the authority to curtail construction  
30 immediately if unseasonal thaws or early spring





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1 breakup significantly reduced the effectiveness of  
2 winter roads in protecting the terrain. This  
3 same authority must be able to delay the start of  
4 construction of winter roads until conditions  
5 are favourable in the fall. This latter point  
6 is particularly important on the Yukon coast where the  
7 lack of snow could be a problem.

8 To summarize, an overview of the  
9 impact of the project on the terrain will now be given.

10 The impact on all properties of  
11 surfaces which characterize landscapes will be severe on  
12 the rights-of-way of the pipeline and access roads and  
13 at all construction sites for related facilities.  
14 The magnitude of impact will vary from the  
15 total and unavoidable terrain damage along the  
16 ditchline to the minor and potentially avoidable  
17 scarring of surfaces due to disruptions of the vegetation.

18 The major impact will be the  
19 alteration of geomorphic features through accelerated  
20 processes, of which erosion and deposition are of  
21 greatest short-term significance and potentially  
22 of long-term importance if mitigative measures are not  
23 rigorously and immediately employed. The intense  
24 cutting action of flowing water will produce both  
25 increased sheetwash and gullying whenever  
26 drainage alterations are induced and any destruction  
27 of the natural thermal insulation will initiate  
28 one or more of a host of geomorphic changes character-  
29 istic of permafrost terrain. These include slumping,  
30 avalanching, and solifluction during the warm season



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1 when disturbed slopes become subject to material  
2 movement over the permafrost table. Such slope  
3 failures will be most evident along the right-  
4 of-way and may be unusually severe at major river  
5 crossings. In areas of high ice-rich permafrost,  
6 all surface changes resulting in elevated ground tem-  
7 peratures will induce ice-melt and ground- subsidence,  
8 including creation of thermokarst topography.

9 The importance of erosion deve-  
10 lopes from the interrelationships of ground surface  
11 to vegetation, microclimates, soils and other  
12 landscape features. The dynamic processes involved  
13 assure change in all components when any one is  
14 disrupted. Erosion processes, unless completely controlled  
15 can be expected to initiate and maintain long-term  
16 sequences of terrain changes.

17 Frost heave, which may be  
18 increased in some susceptible areas, by the thermal  
19 impact of the refrigerated pipeline, may cause  
20 pipeline failure which could have major impact through  
21 fires and the measures taken to effect major repairs,  
22 especially overland travel of heavy equipment in the  
23 warm season. Impeded drainage resulting from  
24 formation of a frost plug around the refrigerated  
25 pipe may cause ponding upslope of the right-  
26 of-way and deprive downstream wetlands of water supply  
27 and induce habitat changes for wildlife.

28 Aesthetically the terrain will  
29 be degraded for an indeterminate time beyond the  
30 life of the Project and for all practical



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1 purposes forever. Palliative measures can  
2 ease the visual impact but not hide it. In forested  
3 areas the clearing of trees will increase the local  
4 impact but the proper alignment, which screens  
5 the right-of-way from ground level view, is a  
6 mitigative opportunity as is the planting of trees as  
7 visual barriers. There is ~~no~~ means of mitigating  
8 the aerial view of the right-of-way  
9 scar in forested areas, nor the aerial or ground  
10 view of the tundra. These are irretrievable aesthetic  
11 losses for times to be reckoned in centuries.

12 The impact of off-road, off-  
13 right-of-way, all-terrain vehicles is avoidable and  
14 would be severe if it occurred. This is  
15 especially true on the tundra where visual scars are  
16 long-enduring and either compaction of vegetation and peat  
17 or scarring of these, can lead to serious thermal  
18 erosion. Unscheduled maintenance and  
19 emergencies, such as pipeline ruptures requiring summer  
20 use of heavy construction equipment, can cause  
21 damages that exceed many times over the  
22 terrain impacts of the initial construction.

23 Winter roads, properly  
24 constructed, will provide the necessary protection  
25 to prevent terrain degradation resulting from con-  
26 struction equipment and at the same time to  
27 provide a level surface for trenching and other pipe-  
28 line assembly work. While recent research has  
29 eased the Board's concern related to the  
30 fundamental capabilities of winter roads under the





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1 frequency and loads associated with pipeline construc-  
2 tion, the applicant's scheduling of the winter con-  
3 struction period is still not completely to our  
4 satisfaction. Serious terrain degradation can be  
5 anticipated from winter roads unless strict controls  
6 are enforced on their construction in the fall and  
7 on their use in the spring.  
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Thank you.

THE COMMISSIONER: Thank you

Dr. Adam.

WITNESS TEMPLETON: Mr.

Commissioner, Larry Bliss would like to talk about the Environmental Impact on Vegetation and Air, and I think it will take about 30 minutes. Do you wish to go that long, I would just as soon not interrupt him in the middle.

THE COMMISSIONER: Yes.

Mr. Goudge, what do you say? Normally, someone would have pointed out by this time that there was a hockey game on tonight, but mercifully it has ended. How does this shape up? We don't want to rush Mr. Templeton and his colleagues. I thought we would sit tomorrow morning and tomorrow afternoon, and again Wednesday, morning and afternoon.

MR. GOUDGE: Well sir, as

I understand it from Mr. Templeton, if Mr. Bliss completed his presentation today, they would be prepared to begin tomorrow at the usual time, and take the morning and have a lunch break around midday if that suits you, sir, and then come back for an hour or two in the afternoon, and perhaps repeat the procedure on Wednesday.

I understood that Mr. Templeton's scheduled presentation had taken account of the schedule that would be much like that.

THE COMMISSIONER: Well, we are in your hands. I would certainly be happy to hear



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1  
2 Mr. Bliss or whenever suits you.

3 WITNESS TEMPLETON: Well, I  
4 think we would like to please.

5 THE COMMISSIONER: Fine.

6 WITNESS BLISS: Mr. Commissioner,  
7 ladies and gentlemen, I am glad I am not competing with  
8 a hockey game.

9 The role of vegetation is  
10 of fundamental importance in all natural systems. And  
11 as this first slide will show, try to summarize a wee  
12 bit of these data.

13 Vegetation serves as  
14 the basis for all natural systems because plants convert  
15 energy from the sun to a form that is usable by plants  
16 as well as animals, including man.

17 Vegetation also provides  
18 important habitat and food for many animals.

19 And thirdly, vegetation  
20 serves as a major utilizer of "sink" for CO<sub>2</sub> and is the  
21 major source then and release of oxygen. In turn  
22 plants and animals collectively release carbon dioxide  
23 and utilize oxygen in respiration. As a result of this  
24 then, vegetation and plants in general serve a very  
25 fundamental role in many of these cycles.

26 Fourthly, vegetation, in  
27 the North especially in these areas we are concerned  
28 about, serves a very fundamental role in water erosion  
29 control and in turn in the North provides a very  
30 important thermal barrier to degradation of the perma-



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1  
2 frost in those areas of ice-rich permafrost. We will  
3 have more to say about this in a few minutes.

4 Thus, plants and their use  
5 of misuse, are a basic key to maintaining the  
6 environmental quality in northern lands.

7 During the first week  
8 of the hearings there was a presentation on the kinds  
9 of plant communities that occur in the north, where  
10 they are found, and why they occur where they do. At  
11 this time a general discussion was presented on the  
12 basic differences between Arctic or treeless areas and  
13 the northern forest or Taiga area. The objective today  
14 then is to present information on the potential impacts  
15 of northern pipeline construction and operation on  
16 these major northern vegetation types as well as on  
17 air quality.

18 For the purpose of our  
19 impact assessment, we prepared several definitions of  
20 impact for air and vegetation. The definitions for  
21 vegetation are as follows:

22 The lateral regional  
23 boundaries for a plant community component was  
24 recognized as 10 miles or 16 kilometers, or on the  
25 side of a natural boundary such as a lake, river, or  
26 mountain range if this was a shorter distance. Any  
27 project component likely to disturb 1 to 5 percent  
28 of a plant community type in a given region is a  
29 moderate impact. If on the other hand more than 5  
30 percent of a given plant community type were to be





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1  
2 disturbed, this would be a major impact.

3 The area covered by  
4 project facilities and right-of-way defines the lateral  
5 boundary for peat and moss integrity. A moderate impact  
6 will occur when a project component disturbs or compresses  
7 the peat and moss mat but leaves it in place such that  
8 regeneration of existing plants is possible. In other  
9 words the underground portions of plants are still left  
10 there and they can regrow from this base. A major  
11 impact will occur when a project component destroys  
12 the peat and moss mat or covers it with gravel such that  
13 there is very little then in the way of natural  
14 vegetation left, and one is forced then to reseed.

15 The definitions for air  
16 quality are as follows:

17 A moderate  
18 impact on air quality is an emission resulting in a  
19 ground-level concentration between 0.001 and 0.05 part  
20 per million of sulphur dioxide. A major impact is an  
21 emission of SO<sub>2</sub> large enough to cause ground-level  
22 concentrations greater than five hundredths of a  
23 part per million since this level has been recognized  
24 as being detrimental to lichen cover over a period of  
25 time.

26 With this introduction  
27 then, I would like now to turn to some specific  
28 examples of vegetation, the role they play, and the  
29 relation then to pipeline construction and operation.



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1  
2 First let us consider  
3 the right-of-way.

4 Pipeline construction  
5 and the associated activities will use approximately  
6 50 miles, square miles of vegetation and terrain north  
7 of the 60th parallel. This will include compressor  
8 stations, communication towers, winter roads, wharves,  
9 supply camps, storage sites, borrow pits, and the like.  
10 Although this is a small percentage of the land within  
11 a vast area, the potential impact on vegetation is great  
12 as can be seen from the Potential Impact on vegetation.  
13 This again only points to the fact that, the second  
14 column over, Dr. Adam was talking about the very first  
15 component there across the top of terrain, the arrow  
16 now points to vegetation, and as you can see in terms  
17 of the mass of yellow and the mass of red on that slide  
18 the potential impact to vegetation and plants in  
19 general was very considerable, if in fact there were no  
20 regulations, no willingness or capability of protecting  
21 the surface cover.

22 The next slide then  
23 will show, in terms of clearing, grading, and construction  
24 the inter-actions of impacts of these operations then on  
25 the various plant communities in the north. Again the  
26 implication here being that if there were no controls,  
27 the potentiality <sup>for</sup> / a major disturbance is again very  
28 high.

29 But, as we can see from  
30 the next slide, in all reality with controls, and now



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1  
2 taking the Interior Route portion, many of the red  
3 squares have disappeared, there are numerous yellow ones,  
4 the impact in fact then appears to be significantly less  
5 than one might predict if there were no regulations.

6 The right-of-way for the  
7 proposed pipeline will be 120 feet in width. Roughly  
8 2/3 of this will be used for the movement of vehicles  
9 as well as the heavy equipment associated with digging  
10 the ditch. The other third of that lateral distance  
11 then will contain the ditch and the spoil<sup>pile</sup>. The need  
12 for revegetation, will be somewhat reduced provided  
13 the vegetation mat can be removed mechanically in  
14 sections and placed to the side so that it can be laid back  
15 over the fill after the pipe has been buried.  
16 The technology to do this has not been worked out with  
17 frozen soils and this needs further experimentation  
18 should the permit be approved. Total destruction of  
19 plant cover over this entire width could occur, especially  
20 if work starts before there is adequate snow cover and  
21 refreeze in the fall, or if the process of construction  
22 proceeds too late into the spring after melt.

23 The right-of-way  
24 through forested areas will be machine cleared with the  
25 exception of hand clearing of trees of merchantable  
26 size. In all areas<sup>where</sup> there should be minimum of clearing  
27 of woody vegetation both within the forest as well as  
28 in the shrub tundra because the vegetation itself  
29 absorbs much of the incoming energy and if removed, this  
30 added heat input into the ground may result in additional





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clearing

1 thaw. So minimum/is another important aspect.

2 Fill over the pipe

3 should be replaced in the same manner that it was removed  
4 so that any organic matter can then appear on top of the  
5 pile over which then either revegetation can take place  
6 or in fact the sod that is put on has a greater  
7 potentiality of plant survival. Activity off gravel  
8 roads north of 63-65 degrees, where there is sporadic  
9 permafrost, must be done only in winter when there is  
10 sufficient refreeze to support heavy equipment. This  
11 implies that north of this position, only winter  
12 construction will be done. Emergency repairs in summer  
13 must be with vehicles that have low pressure surface  
14 impact.

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1  
2 I want now to cover a topic  
3 that Dr Adam covered in part, winter roads, because  
4 here again as he pointed out to you, there's a tremen-  
5 dous inter-action of terrain and vegetation, and since  
6 this is one of the activities during the course of  
7 construction, that has the greatest impact to the two  
8 main components, we felt that this should be added to.

9 There will be many miles of  
10 winter roads associated with the project. They will  
11 include the working surface adjacent to the ditch,  
12 the parallelling supply roads, as well as many lateral  
13 supply roads for supplies and the like. All of these  
14 must be constructed after re-freeze, using snow, ice,  
15 or snow-ice combination. Winter haul roads used in  
16 exploratory phase of gas field activities have shown  
17 that they can result in very little surface degradation  
18 even though they may be used for several winters, pro-  
19 vided they're properly constructed.

20 I will now show several slides  
21 to illustrate this a wee bit. This is a winter road  
22 used by Gulf Oil for three years, constructed of snow  
23 and ice two years, and of snow the third. Yes, there is  
24 surface disturbance of the top of this hummocky terrain  
25 but lots of plants have survived and when left alone  
26 or if in fact fertilizer were added, re-growth occurs  
27 at a pretty rapid rate.

28 This is a road used one  
29 winter in 1973-74. Again coming back to the point  
30 that Dr. Adam made, those winters in which there is



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1  
2 not early snow will present a problem then in terms  
3 of winter snow road construction. In this particular  
4 case there was a winter with little snow, they built  
5 this road out of ice, it was three inches thick, they  
6 transported 150 to 180 loads of equipment over this,  
7 this is as viewed then the following summer. Essentially  
8 no surface disturbance at all, so it shows that this  
9 can be done, and has been done.

10 On the other hand, in those  
11 situations where if for one reason or another it is  
12 necessary to go out in the spring of the year after  
13 melt has begun, the ground is beginning to thaw, merely  
14 one pass of heavy equipment to bring in other equipment  
15 can result in this amount of rutting. So again it's  
16 a matter of snow cover, length of the winter season  
17 during which operations of this kind can be done  
18 without conflict to terrain and vegetation.

19 The experimental roads at  
20 both Norman Wells and Inuvik showed that when con-  
21 structed of snow and ice to a depth of several feet  
22 they will accommodate thousands of loads of equipment.  
23 This is a ground view of the Inuvik test road that  
24 has been referred to before, where if I remember  
25 correctly, there were roughly 30,000 passes of  
26 equipment during the winter, and this is as it appeared  
27 then last summer, the summer after that winter use,  
28 and a closeup then to show that the lichen cover and  
29 the ground vegetation that had not been hand-cleared  
30 is intact. This comes back, and I want to reinforce



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1  
2 the point that in many areas<sup>if</sup>/hand-clearing in those  
3 areas where re-vegetation is not anticipated to be  
4 needed can be done, it will again facilitate main-  
5 taining the integrity of this ground surface of  
6 peat-lichen cover, therefore maintaining it as a  
7 better thermal barrier against potential heat input  
8 and melt out.

9 THE COMMISSIONER: Dr. Bliss?

10 A Yes?

11 Q I didn't quite follow  
12 that.

13 A Surely.

14 Q What was the significance  
15 of hand-clearing or not hand-clearing?

16 A The significance of hand-  
17 clearing is that if hand-clearing is done, you're  
18 not using heavy equipment, there's not the probability  
19 of gouging into the surface or of pushing trees over  
20 or shrubs over, and therefore breaking the integrity  
21 of this ground surface. This assumes, then, of course,  
22 that roads will be built of an adequate thickness and  
23 be maintained of a high quality during the course of  
24 the winter. Pressure will be very great to extend  
25 the period of winter construction, should there be an  
26 early spring thaw. That would result, then, in deter-  
27 ioration of the road at a time when contract commit-  
28 ments call for additional miles to be constructed.

29 Thus we fear that although  
30 the technology is available to handle the movement of





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1  
2 supplies over winter roads, in a manner which will  
3 result in little terrain or vegetation disturbance,  
4 reality says that this practice will be very difficult  
5 to maintain under tight schedules of construction and  
6 the magnitude of construction costs.

7 Another concern centers  
8 on the problems getting to the source of water or  
9 snow or gravel for the initial construction of these  
10 roads, should there be an inadequate snow cover, thus  
11 this aspect needs to be considered too. The long-  
12 term and indirect effects of winter roads has yet  
13 to be fully evaluated. Additional research on this  
14 is needed prior to the start of winter construction.  
15 Winter roads adjacent to the pipeline, as well as the  
16 ancillary roads, have the potential for the greatest  
17 environmental impact of the entire project, unless the  
18 construction and operation is highly regulated.

19 Experience in the Mackenzie  
20 Delta shows, over the last five years, that winter  
21 roads constructed through low and wet vegetation are  
22 far less detrimental than roads constructed through  
23 upland shrub vegetation, simply because in low wet  
24 areas the plants re-growth from a root base easily  
25 each year anyway; while in the upland areas the  
26 brittle stems of the shrubs are broken off, in turn  
27 very frequently the terrain/<sup>tends to be,</sup>the surface, the vehicles  
28 trying to gather traction as they go up-slope tend  
29 to disturb the surface to a greater degree, and as a  
30 result then re-vegetation is more difficult in those



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1  
2 areas. So the message here is where possible keep to  
3 the wet lowland areas. The plant cover there can  
4 handle the situation to a greater degree.

5 Next I'd like to cover very  
6 briefly the operation of a cold pipeline and drainage  
7 disruption as a result of a cold pipeline.

8 Throughout the permafrost  
9 section of the route, the pipeline will be operated at  
10 below freezing temperature. This will maintain colder  
11 soils in summer than would occur naturally. To my  
12 knowledge, there are not sufficient data available yet  
13 to show what the impact of colder soils will have on  
14 establishment and maintenance of vegetation directly  
15 above this cold pipe. We do know, though, that from  
16 experimental work done at Norman Wells, that there is  
17 a significant difference in the rate of plant establish-  
18 ment and plant grown on the warm loop versus the cold.  
19 In the foreground you see the warm loop, which was  
20 operated at temperatures of roughly 15 degrees Centi-  
21 grade. A year or so after plant establishment there  
22 is this amount of cover, versus in the background on  
23 the cold loop at minus 8 degrees Centigrade, relatively  
24 little vegetation, the same experimental plot put in,  
25 species handled in the same manner. So that at least  
26 there are initial data which show that a cold pipe  
27 with cold soils is detrimental to plant growth simply  
28 because plants, like humans, do better when it's a  
29 bit warmer.

30 The cold buried pipe may also



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1  
2 be effective, in impeding lateral water drainage, which  
3 may result in impoundments with a potential for under-  
4 cutting the pipe and changing vegetation in some loca-  
5 tions. Granular fill can reduce this potential, but  
6 there are indications in the literature that this may  
7 still be somewhat of a problem. This matrix again shows  
8 the location of drainage in terms of this disruption,  
9 and finally then, the potential or probable impact  
10 in terms of this.

11 Again, the potential in terms  
12 of poor handling of the situation from an engineering  
13 and environmental point of view can be very disastrous.  
14 On the other hand if well handled it can be much less  
15 severe. It appears then that additional research in  
16 this area is needed, as well as close communication  
17 with the Alyeska Pipeline constructed in Southern Alaska  
18 -- that portion of it -- regarding this problem. There  
19 is a considerable movement of water in the spring with  
20 snow melt, even on relatively flat land, and the fill  
21 itself will potentially block lateral drainage in  
22 some locations. This again was shown in one of the  
23 slides of Dr. Adams.

24 Thus here also then there is  
25 no doubt it will be necessary to go back in one to  
26 five years in some areas to do some ancillary work in  
27 terms of handling lateral drainage.

28 Next, emergency repairs.  
29 During the operation of the pipeline one can assume  
30 it will be necessary to repair sections of the line





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1  
2 when the ground is not completely frozen. In some  
3 cases, equipment may be flown in by helicopter to  
4 repair a location, but it may in many instances require  
5 the movement of low-pressure vehicles over the right-  
6 of-way. The exact route along the right-of-way for  
7 the movement of vehicles should be chosen with regard  
8 to the sensitivity of newly established vegetation in  
9 the first couple of years of construction, and to  
10 specifically then respond to your comment of a half  
11 hour or so ago, in terms of looping, yes, in terms of  
12 this then, of maintaining the vegetation cover, this  
13 would have an impact in coming back and laying another  
14 line. It might also then have an implication in terms  
15 of how much one worries about re-vegetating that  
16 immediate strip adjacent to the previous pipe, or  
17 in fact determining how far away that next pipe is  
18 going to be in terms of how one handles the re-vegetation,  
19 or in fact, how wide the total right-of-way will be.

20 Even with the use of low  
21 pressure vehicles, surface disturbances will be diffi-  
22 cult to prevent within wet sedge communities, of the  
23 tundra as well as wet marshy areas within the forests. and forest tundra  
24 The potential for terrain degradation and the melt-out  
25 of massive ice is greatest on side slopes, crossing  
26 streams and the crest of hills and ridges, where a  
27 thaw layer may be peeled off as the vehicles move up  
28 the hill. That's showed in that one shot of the winter  
29 road of the low area versus the road going on up over  
30 that little low hill.



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3 The basic recommendation is  
4 to use as light-weight vehicles as possible, to turn  
5 them on as broad a base as possible, or radius, and  
6 to be aware of vegetation terrain types that are most  
7 susceptible, as well as least susceptible to summer  
8 disturbance.

9 River crossings. River and  
10 stream crossings present special problems because of  
11 the potential for massive ice melt-out as well as  
12 water erosion. Wider and deeper cuts will be necessary  
13 along rivers that are more deeply entrenched in the  
14 landscape. The use of special grading techniques  
15 along with preceded erosion control mats will be  
16 necessary in these areas. Where ice content is high,  
17 with the potential for mud flow after spring flood,  
18 stabilization by plants will be a slower process.  
19 In such areas, re-vegetation and slope stabilization  
20 will be required for several years after the line is  
21 put into operation.  
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1 And in turn, revegetation  
2 will not, based upon our present knowledge, stablize  
3 a thermal regime in these sites. In other words,  
4 we can't rely on a new plant cover stablizing  
5 the heat input enough into this soil to prevent  
6 further degradation of permafrost, should it be  
7 ice-rich terrain.

8 Revegetation as such.

9 Revegetation of disturbed  
10 soil areas is essential not only to maintain slope  
11 stability and reduce erosion, but also to help  
12 stablize the thermal regime of soils in permafrost  
13 regions as well as to provide a more rapid return  
14 to plant cover from the standpoint of aesthetics  
15 and the need for wildlife habitat. A considerable  
16 amount of research has been conducted with this  
17 in mind not only by the applicant, but elsewhere in  
18 North America. As I am sure you know, there has  
19 been a considerable amount of cooperation between  
20 the Alyeska group and the consortium here in terms  
21 of the gas pipeline in this area.

22 Common methods of  
23 revegetation are, applying seed, fertilizer and in  
24 some cases transplanting shrubs and grasses have  
25 been used. Due to the considerable range of latitude  
26 with its associated changes in vegetation and  
27 climate, it will be necessary to use various  
28 combinations of species and seed mixes in the  
29 forest, versus the forest tundra, and the arctic  
30 tundra itself; and this next little group of



1 slides will illustrate this.

2 This very first one  
3 dramatizes the business of plant succession in the  
4 Arctic and the fact that there are few native grasses  
5 that come in on their own very abundantly, at  
6 least at times. This is the winter road, very  
7 near the Tuk base of Imperial Oil, about six years  
8 after it had been used and you can see a tremendous  
9 amount of plant cover on that site. We use, then,  
10 keys or clues of this kind, to sort out what  
11 species to use in our initial studies and revegetation.  
12 We used then not only northern native species, but  
13 we also got seed from several experiment stations,  
14 established plots then at Norman Wells, and Inuvik,  
15 at Tuktoyaktuk and Prudhoe Bay. The sponsor  
16 established several sites too, for revegetation  
17 studies.

18 This was our initial  
19 plot at Inuvik in 1970. With the various species  
20 beginning to grow <sup>with</sup> various fertilizer treatments to  
21 see what would happen. This then, is that very  
22 same plot in 1974. You can no longer see the  
23 initial plot, simply because those couple of native  
24 grasses in part also seeded in, but they have  
25 now come in on their own in addition to that and tho-  
26 roughly taken over the site to the tune that the  
27 heads of those grasses were clipped off before  
28 I took that picture for the seed to be used again  
29 in revegetation studies; so that this again  
30 dramatically shows, at least within the northern





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1 forest tundra and it is also true within the forest,  
2 that revegetation is a relatively easy phenomenon  
3 to carry forth.

4  
5 Now, let's move 50 miles  
6 away and go to Tuk. That plot was established the  
7 same year as the previous one. That is three  
8 years later, / <sup>and</sup> the amount of plant cover with the  
9 same species. It is a measure then of the change  
10 in climate and the ability for plants to grow when  
11 established.

12 Let's now move to Prudhoe  
13 Bay and another order of magnitude reduction,  
14 but added to it the fact that we now have  
15 nice, lush vegetation, unfertilized plots with  
16 caribou around, and that is nice pasture even though  
17 they are just little green strips, but you can  
18 see how much less plant cover there is here. In  
19 fairness, this is only a year after establishment,  
20 while the others were three or four years, but the  
21 fact remains that going that much further north,  
22 plant establishment becomes that much more  
23 difficult. That is the main message, and there are  
24 fewer species that can be used in this process.

25 Research conducted then  
26 shows that plant cover can be provided no most  
27 sites, although the rate of plant growth and  
28 its ability to stabilize soil erosion and thermal  
29 erosion are significantly reduced in going from the  
30 forest out into the tundra. Again, most of the  
data to date show that revegetation is not effective



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1  
2 in preventing permafrost melt. Especially within  
3 the tundra.

4 On steep slopes, especially  
5 at river crossings, seeded mats and shrub transplants  
6 will be necessary. Provided the vegetation mat can  
7 be stripped off and in reasonable size units, piled  
8 to the side and <sup>then</sup> redistributed back over the spoil,  
9 plant cover and its rate of growth can be increased.  
10 The considerable amount of research as to seed  
11 mixes and fertilizer levels indicates that in  
12 most areas a reasonable plant cover can be provided  
13 in one to three years. Because of the more rapid  
14 establishment of native species, a high priority  
15 for their use in seed mixes is evident and therefore  
16 the need to have an adequate supply of commercial  
17 seed within two to four years and I am happy  
18 to tell you that the sponsor has been working on  
19 this for several years. Knowing that they have  
20 got to have a seed supply in advance, that is why some  
21 of those plants were clipped off so that the seed  
22 could be used in some of those initial business of  
23 getting on with seed production. Establishment of  
24 plant cover on peat land on the other hand is  
25 much more difficult and there is <sup>a</sup> considerable  
26 portion of the line that runs through that kind of  
27 terrain. The problem here is, that the species  
28 that do well on peat or sedges and those doggone  
29 things don't -- they produce lots of seed but  
30 they don't germinate readily and easily. Therefore,  
as long as we are dealing with relatively drier sites



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1 and with grasses, we have got a reasonable degree  
2 of potential for success, but in wetlands, and  
3 their normal cover of sedges, the probability is  
4 less of using the same kind of approach that we have  
5 with the grasses in somewhat drier sites.

6 Sections of the winter  
7 road along the pipeline right-of-way as well as  
8 access winter roads and other abandoned sites will  
9 also need to be reseeded -- possibly different years,  
10 such -- should the catch of grasses not be adequate  
11 in the first time, I have already mentioned  
12 this business then, that in adding vegetation of  
13 plant cover back as well as fertilizer, it is  
14 nutrient rich and animals like it and then <sup>there is</sup> that  
15 conflict of nice pasture land for animals and the  
16 potentiality then for the need for reestablishing  
17 vegetation in relation to animal grazing.

18 Next, let's move to  
19 fire. Fire is an integral part of the boreal  
20 forest region as well as the southern tundra. While  
21 fire frequency may increase during construction and  
22 operation of the pipeline, the size of burns will  
23 decrease because of greater surveillance capabilities.  
24 The likelihood of fire resulting from activities  
25 related to pipeline construction, operations and  
26 maintenance can be evaluated from information on  
27 1) distribution and flammability of plant communities  
28 along the route, and this was an integral part of the  
29 original vegetation survey, to determine the capability  
30 of the vegetation to carry fire. We are proud that





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1 we initiated that. Location and timing of  
2 pipeline activities in relation to the potential  
3 for starting fires, a second point; and thirdly,  
4 climatic conditions as they affect the  
5 spread of fire at the time.

6 Of the various vegetation  
7 land forms along the route, the coastal tundra and  
8 the Mackenzie Delta area of tundra and forest  
9 tundra is least susceptible to burning and the  
10 Mackenzie Valley then, both the northern and  
11 southern sections are most susceptible. These  
12 are vegetation types with large amounts of  
13 forest litter and have relatively limited areas  
14 of wetlands. Although fire removes most of the  
15 vegetation and therefore results in increased soil  
16 erosion, river siltation and the potential for  
17 thermal erosion with ice melt in limited areas,  
18 there are insufficient data to categorically state  
19 that forest fires are all bad. There is a  
20 growing body of evidence which shows that fire which  
21 results in a warmer soil and a deeper summer thaw,  
22 permits the new generation of vegetation to tap a  
23 larger pool of nutrients and therefore to increase  
24 the vigour of the new forest generation.

25 In turn, through plant  
26 succession, shrub and other kinds of vegetation are  
27 highly desirable habitat for many animal species,  
28 including moose and beaver.

29 On the other hand, the  
30 mature forest is necessary for marten and squirrel,



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1 so, change the habitat, you change the animal  
2 component as well.

3 There has probably been too  
4 much emphasis on the negative aspect of fire in  
5 relation to burning lichen woodland and <sup>the</sup> detrimental  
6 role it plays in the winter ecology of caribou.

7 The most recent information and the general  
8 pattern in magnitude of forest fires indicates that  
9 caribou are less influenced by forest fire than some  
10 studies have indicated.

11 In summary, although fire  
12 frequency may increase the total area of land burned,  
13 it may actually decrease because of greater fire  
14 surveillance and more mobile forces to combat the  
15 fire. One mechanism that can decrease fire potential  
16 would be to use a greater amount of wood chipping  
17 and the blowing of chips into undisturbed vegetation,  
18 rather than the current plan to burn all material  
19 on the right-of-way on fire sleds. Some of the chips  
20 can be used in mulching, in revegetation and  
21 erosion control, in areas of revegetation one would  
22 then have to add nitrogen fertilizer to speed  
23 up plant growth, simply because you add an amount,  
24 a large amount of organic matter, the microbes  
25 begin chewing on this, utilizing it as a food source  
26 and therefore nitrogen supply for plants goes  
27 down. Chipping and burning need special control  
28 near rivers and lakes to prevent this excess  
29 organic matter from getting into water bodies.  
30 This whole area needs further evaluation before



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1 final decisions can be made.

2  
3 Air quality. From the data  
4 available it appears that the natural gas at Prudhoe  
5 Bay in the Mackenzie Delta is sweet gas and thus  
6 has a low sulphur dioxide content. However, there is  
7 no guarantee that all gas found in the north will  
8 be of equal low sulphur content. Studies have  
9 shown that  $\text{SO}_2$  in low concentrations of a half --  
10 500ths of a part per million, can damage lichens  
11 with long exposure.  
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1  
2                   The potential for environmen-  
3 tal concern is present, although in reality there are  
4 no strong indications of this at the present time.  
5 Along the Arctic coast there are many foggy days in  
6 summer, that<sup>will</sup> tend to hold emissions from compressor  
7 stations and other activities close to the ground  
8 which can then have an effect on increasing the poten-  
9 tial for plant damage.

10                   Just again very briefly, sir,  
11 there are the flags, they indicate where our air  
12 quality inter-act with vegetation and finally then  
13 the impact here in terms of the presence of sulphur-  
14 dioxide in relation to the operation then of the line.

15                   The potential for excess  
16 emissions is no doubt far greater at the gas scrubbing  
17 plants in the Mackenzie Delta and at Prudhoe Bay than  
18 at collective compressor stations, along the route.  
19 Emissions from their stacks should be continuously  
20 monitored throughout their operation. Based upon the  
21 evidence from elsewhere in the world, it is my opinion  
22 that the pipeline and its directly associated activities  
23 will probably have less impact on air quality than any  
24 additional development such as mining and smelting that  
25 may follow this energy corridor. Here, as environmental  
26 aspects of the pipeline and gathering system, there is  
27 a probable less concern with this project than the  
28 potential for long-term implication of associated human  
29 activity, once the energy corridor is established. By  
30 this I imply roads, the increase in size of towns,





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1  
2 mining, smelting, hydro electric and the like. Last  
3 but not least, wilderness and ecological reserves.

4 One of the most important  
5 features of our north is the vast, relatively unbroken  
6 wilderness. Although we as ecologists would like to  
7 see such areas remain wilderness, as long as possible,  
8 it would be unrealistic for us to assume that this  
9 can or will happen in the future, as population in-  
10 creases, and our need for raw materials increases.  
11 However, it behooves us to establish natural preserves  
12 and maintain as much of the northern land in the wilder-  
13 ness state as we can.

14 As stated in my introductory  
15 remarks, natural vegetation plays this essential  
16 role in cycling of gases in the atmosphere, preventing  
17 erosion, preventing thermal input, and providing  
18 animal habitat. The north is no exception. As can  
19 be seen from the map, there are eight international  
20 biological or I.B.P. preserves that have been proposed  
21 in the Yukon and Northwest Territories that are in  
22 close proximity to the proposed pipeline. The biggest  
23 unit that you see up there in the corner, the north-  
24 west corner of the Yukon, is a combination of several  
25 of those I.B.P. sites, plus the rest of the area filled  
26 in designated a proposed Yukon Wildlife Range, which  
27 as you can see then, is contiguous with the Alaska  
28 Wildlife Range on the other side.

29 We're very much concerned  
30 that areas such as this should be set aside. In fact,



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1  
2 these preserves  
3 on the Yukon and Northwest Territories side, total  
4 8,570 square miles compared with the 130,000 square  
5 miles, roughly 50% of the total area that the United  
6 States Government is proposing to set aside in  
7 Alaska. Let me repeat, 8,000 roughly versus 130,000.  
8 In terms of Alaska, this includes National Parks,  
9 Wildlife Refuges, national forests and wild/<sup>and</sup> scenic  
10 rivers.

11 These ecological reserves  
12 that have been proposed are of varying size in the  
13 Yukon and Northwest Territories. The largest ones  
14 are two to 5,000 square miles; while others are only  
15 a few square miles. To our knowledge, there are no  
16 rare or endangered species of plant or plant communi-  
17 ties that occur along the pipeline route, but should  
18 rare species be found, we would expect that they  
19 should be transplanted into some of these preserves  
20 so that they could be maintained.

21 In terms of our flagging of  
22 these kinds of areas then, this slide shows two of the  
23 I.B.P. proposed sites, one the Caribou Hills just  
24 to the north of Inuvik, and the Campbell Lake Preserve  
25 to the south, and secondly then honing in on the  
26 Campbell Lake one, again showing the kinds of activi-  
27 ties of construction that would be involved and  
28 operation -- you can see that there is a compressor  
29 plant to be located almost contiguous with this, as  
30 well as the pipeline itself, communication tower, the  
other little symbol down there on the right symbolizes



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1  
2 a gravel pit or borrow pit, the birds symbolize that  
3 this is a raptor habitat area, and you can see also that  
4 the highway already traverses this particular preserve.

5 It is essential that some of  
6 the preserves, such as the Yukon Wildlife Range, be  
7 large enough -- we can have the lights -- to include  
8 most of the habitat for large animal species, such as  
9 grizzly bear, Dall sheep, bering ground caribou.  
10 Otherwise there is very little point in setting aside  
11 preserves unless they include enough of the native  
12 habitat of these mammals to be able to maintain them.

13 Finally in summary, conclu-  
14 sions and recommendations, when environmental and  
15 technical concerns overlap in relation to the pipeline,  
16 there is a high probability that sound engineering  
17 practices will contribute to terrain and vegetation  
18 stability, such as preventing melt-out under  
19 and over the pipe. However, many on and off right-of-  
20 way engineering practices are detrimental to vege-  
21 tation.

22 Recommendations that have  
23 been made to protect terrain will also protect the  
24 vegetation under some conditions. Terrain and  
25 vegetation damage will be kept to a much lower level,  
26 provided winter roads are properly constructed, utili-  
27 zed and abandoned prior to spring breakup; summer  
28 traffic through wet forest lands and wet tundra lands  
29 must be avoided except under extreme emergency condi-  
30 tions, and then only by low pressure tire vehicles.





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1  
2 Where possible, slash should be chipped and used as  
3 much as -- as mulch, or blown into native vegetation  
4 rather than merely burned. Fire management programs  
5 for the north must be developed, although fires dis-  
6 tant from the pipeline that do not threaten the  
7 integrity of the line or human communities or merchant-  
8 able timber should probably be not of special concern.  
9 What we're saying here is that one need ~~not~~ fight all  
10 fires. Fire is a normal part of the environment, as  
11 I said during my first week, and under numerous  
12 circumstances they burn themselves out anyway, it's  
13 probably not very practical to fight them.

14 Additional research is needed  
15 into the effect of a cold pipeline on re-vegetation,  
16 and the ability to skim off sod and replace it back on  
17 the pipeline berm. Some additional work on determin-  
18 ing the best mixes of species to be used in re-vegeta-  
19 tion and emergency procedures to be used in stabilizing  
20 slopes that may be subject to water and thermal erosion  
21 is needed. The survey of vegetation along the route  
22 has and will continue to serve a vital role in final  
23 planting of pipeline construction and land management  
24 along the right-of-way. I would like to compliment  
25 both the sponsor as well as the Federal Government on  
26 the roles they have played in the vegetation survey  
27 research, and the knowledge that we have gleaned from  
28 them, not only scientifically but which can be used  
29 and is being used in the management now. Thank you.

30 MR. GOUDGE: Mr. Commissioner,



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I note that it's now slightly after 5:30. I wonder if  
this might be a convenient place to break?

THE COMMISSIONER: All right,  
we'll adjourn till nine o'clock tomorrow morning then.

(PROCEEDINGS ADJOURNED TO JUNE 3, 1975)

347 Canada. National  
M35 Energy Board  
Vl.46

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## MACKENZIE VALLEY PIPELINE INQUIRY

IN THE MATTER OF AN APPLICATION BY CANADIAN ARCTIC  
GAS PIPELINE LIMITED FOR A RIGHT-OF-WAY THAT MIGHT  
BE GRANTED ACROSS CROWN LANDS WITHIN THE YUKON  
TERRITORY AND THE NORTHWEST TERRITORIES FOR THE  
PURPOSE OF THE PROPOSED MACKENZIE VALLEY PIPELINE

and

IN THE MATTER OF THE SOCIAL, ENVIRONMENTAL AND  
ECONOMIC IMPACT REGIONALLY OF THE CONSTRUCTION,  
OPERATION AND SUBSEQUENT ABANDONMENT OF THE ABOVE  
PROPOSED PIPELINE

(Before the Honourable Mr. Justice Berger, Commissioner)

Yellowknife, N.W.T.

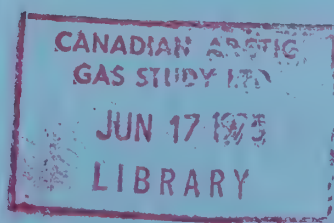
June 3, 1975.

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PROCEEDINGS AT INQUIRY

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VOLUME 47







APPEARANCES:

Mr. Ian G. Scott, Q.C.	
Mr. Stephen T. Goudge,	
Mr. Alick Ryder and	
Mr. Ian Roland	for Mackenzie Valley Pipeline Inquiry;
Mr. Pierre Genest, Q.C.	
Mr. Jack Marshall,	
Mr. Darryl Carter, and	
Mr. John Steeves	for Canadian Arctic Gas Pipeline Limited;
Mr. Reginald Gibbs, Q.C.	
Mr. Alan Hollingworth	for Foothills Pipelines Ltd.;
Mr. Russell Anthony,	
Prof. Alastair Lucas	for Canadian Arctic Resources Committee;
Mr. Glen W. Bell and	
Mr. Gerry Sutton	for Northwest Territories Indian Brotherhood and Metis Association of the Northwest Territories;
Mr. John U. Bayly	for Inuit Tapirisat of Canada and the Committee for Original Peoples' Entitlement;
Mr. Ron Veale and	
Mr. Allen Lueck	for Yukon Native Brother- hood;
Mr. Carson H. Templeton	for Environment Protect- ion Board;
Mr. David Reesor	for Northwest Territories Association of Muni- cipalities
Mr. Murray Sigler	for Northwest Territories Chamber of Commerce

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Yellowknife, N.W.T.

June 3, 1975.

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

MR. GOUDGE: Mr. Commissioner,  
I think we're prepared to resume, Mr. Templeton  
perhaps taking the ball.

CARSON H. TEMPLETON,  
K. ADAM,  
L.C. BLISS,  
N.J. WILIMOVSKY,  
D.W. CRAIK,  
IAN McTAGGART-COWAN,  
E. GOURDEAU, resumed:

WITNESS TEMPLETON: Mr.  
Commissioner, last night I was talking to Mr. Goudge  
and I asked him if he had any questions he would  
like to ask us, and he said, "Well, I only have one.  
What did you say?"

THE COMMISSIONER: He was  
being facetious.

WITNESS TEMPLETON: I would  
use that lead to sort of repeat where we are in  
our report. We talked about the Board, the concept,  
and we discussed this old autonomous bit, our major  
objectives and how we went about assessing impact, and  
how we chose our concerns and how we eventually arrived  
at the list of impacts which were land in its natural  
state, northern peoples, birds, mammals, fishes,  
vegetation, archeological resources, air, water,  
terrain, and then the total and cumulative effects.  
We discussed the matrices and we stressed that predic-  
tions are tied intimately to controls, and then we





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1  
2 launched into our environmental impact assessment, and  
3 we discussed two or those impacts -- terrain and  
4 vegetation.

5 Today we would like to discuss  
6 the, continue on the environmental impacts and these  
7 are the aquatic environments, birds, mammals, land in  
8 its natural state, land and the northern peoples, total  
9 and cumulative, and by that time you will have heard  
10 our impact assessment complete.

11 Next we would like to be  
12 setting the scene for our recommendations, and to do  
13 that setting the scene, we would like to discuss the  
14 existing framework for environment protection, the  
15 controls that we keep repeating, and these would be  
16 by the applicant. This is the existing framework,  
17 the applicant, the government, and the public.

18 So I think we could perhaps  
19 go on now to discuss the aquatic environment by Dr.  
20 Norman Wilimovsky.

21 WITNESS WILIMOVSKY: Mr.  
22 Commissioner, participants of the Inquiry, my name is  
23 Norman J. Wilimovsky. My purpose is to review the  
24 environmental ramifications of the proposed project  
25 on fishes and water, so as to permit and assist in  
26 the development of the terms and conditions with  
27 reference to such activities.

28 This analysis will consider  
29 the potential inter-actions of the project on the  
30 aquatic biota or life in the water which they inhabit.



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2 The Inquiry has already heard the background reviews  
3 on the aquatic environment by Lee Doran and Chris  
4 Hatfield. They and the Board emphasized the concepts  
5 of the total system, however limited in the means of  
6 reporting, the studies were based on the system. They  
7 and we have emphasized the relation or the evolution  
8 of fishes to the environment, that is, their adaptation  
9 to the northern habitat, how 35 some odd species  
10 have come to be able to live in the waters that they  
11 do live in. They also emphasized the total resilience,  
12 the ability to react to change of the biological system,  
13 particularly the fishes. Within that range or ability  
14 to react the system isn't fragile, it's very robust,  
15 and the fish can, and other aquatic invertebrates,  
16 respond to changes; transgressing such limits, then the  
17 system does become sensitive, and the usual lay term,  
18 fragile.  
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In Chief

1                                   They emphasized that there  
2 were differences in numbers within each watershed and  
3 I believe indicated less than ten, seven to be  
4 precise, fishes living on the northern slopes and it  
5 is for that reason that on the basis of fish alone,  
6 the Coastal Route is preferrable over more southerly  
7 routes where there are more species involved, both  
8 in terms of life and use.

9                                   The Board's concerns are  
10 over --

11                                  THE COMMISSIONER: Excuse  
12 me, Doctor. You say that the Coastal Route is  
13 preferred to the Interior Route because there are  
14 fewer species on the coast?

15                                  A       Totally in terms of  
16 -- on the basis of fishes, sir. There are  
17 fewer species along the coast than farther south.  
18 We are talking about fresh water fishes.

19                                  THE COMMISSIONER: Yes.

20                                  A       The Board's concerns  
21 are over habitat changes beyond to what the  
22 fish and other aquatic organisms can respond. Any  
23 perturbations or changes to the system, such  
24 as unnatural introductions, particularly as these  
25 things might relate to the life history and population  
26 dynamics of the fishes. In other words, their whole  
27 life style: how is it affected by any such changes.  
28 Biologists ordinarily consider three factors in  
29 virgin populations at spawning or birth, their  
30 growth and their death, and one that is intimately



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1  
2 concerned in the case of most aquatic organisms is  
3 their movement and so we added the fourth among  
4 our chief concerns.

5                   These primary potential im-  
6 pacts involve at least the following, things  
7 that can affect the foregoing<sup>four</sup> items: increase  
8 of sediment concentration, significant changes  
9 in water quality itself, such as oxygen; obstructions  
10 to fish movement, and artificial introductions into  
11 the system of harmful or toxic materials, that is,  
12 accidental spills.       And finally increases in  
13 mortality. Translated, a greater harvest rate of  
14 sport or commercial or home use fishes.

15                   The Board's greatest concern  
16 is manifested during the time of construction and  
17 the points of concern are roads and other access  
18 related constructions and gravel removal because  
19 both of these have the potential for introduction of  
20 sediment into the system.

21                   River crossings are the  
22 second point, We are concerned about river crossings  
23 primarily because of the possibility of obstruction  
24 to fish movement and again increase of sediment  
25 loads. We are concerned, as I indicated previously  
26 about accidental spills of potential pollutants and  
27 the use of explosives, more importantly, the time  
28 of use of explosives.       And finally, the improved  
29 access to the resource itself and the effect on  
30 its harvest.





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1                                   Let us consider briefly  
2 each of these points. As already illustrated by  
3 a number of my associates, one of the several  
4 possible approaches to the question of interactions  
5 is through the use of matrices. We also use the  
6 matrix system in analysing the interactions between  
7 the aquatic environment and construction activities.  
8 The definitions that have been employed are detailed,  
9 sir, in volume III of our report. The matrix  
10 divisions are by water system, that is watershed, and  
11 we also have site specific interactions identified and  
12 we could go through several slides on this if it  
13 is desirable.

14                               These site specific interac-  
15 tions are based on adherence to good construction  
16 practices and we have also, as noted in Volume III  
17 and elsewhere in the Board's reports, have identified  
18 the problems associated with each of these site  
19 specific interactions.

20                               Primarily the interactions were  
21 characterized as short term or long term. The  
22 short term changes affect only a few year classes  
23 or life stages of the organisms and therefore  
24 recovery is possible over the span of life that a  
25 beast living in the water covers. In other words,  
26 simplifying the case to its utter extreme, if an  
27 animal lives five years and breeds in every one of the  
28 five years an impact that covered only a portion  
29 of that five year period was considered short term or  
30 minor, if an impact extended beyond that time span, it



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1 was considered major and major impacts in this state  
2 extend over several years or even the life of the  
3 project.  
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Please do not misconstrue that simple example, because fish don't breed every year of their life. It takes sometime for them to mature and the production of progeny is greatly reduced in later years in life, in some species.

Perhaps a simpler way of looking at it would be a ladder, and if you take out some rungs, you can still reach the next rung; but if you take out too many there is no way you can get to the top of the ladder.

Now we used this system to record our impacts, and we based it on the initial construction statements, and referring, sir, to your question of 2 June, on looping and the effects thereof, I would emphasize that on fishes the effect of looping would depend on when such looping was performed before the recovery of those ladders had got their rungs back, or later. All bets, all predictions - strike "bets", please -- all predictions are off relating to fish habitat impacts if the rules of the game are changed, and this assessment is based on the stated assumptions in the Board's report.

Our specific construction related concerns are as follows: All of these interactions, all of these concerns are inter-related but the dominant one is expressed in increased siltation. Now, many rivers in the north are very silty now. They carry heavy loads of micro materials, living and dead. So how can we be concerned about the levels of silt?





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1  
2 Well, fishes are adapted to  
3 different levels of silt, and those beasts that live  
4 in clear water usually require that during most stages  
5 of their life. The tolerance of fish to high silt  
6 loading varies with each species and has been tested  
7 in detail for only a few. The most recent work on this  
8 suggests that those fish that live in silty waters  
9 can stand the greatest increases in silt up to a given  
10 level; conversely, those that live in clear water  
11 can withstand only the slightest perturbation of  
12 the system, change to the system.

13 Siltation by itself affects  
14 spawning grounds by getting in between the cracks of  
15 the rocks and gravel where fish lay their eggs, and  
16 silt can also limit food production in nursery areas.  
17 There is -- there are some guidelines as to the amount  
18 of additional silt loading that water sheds can bear  
19 without hurting the fauna, and the simplest way to say  
20 this (although I understand the word has different  
21 meanings to different people, I use it in the mathe-  
22 matical sense) is that loading can increase by one or-  
23 der of magnitude and not hurt the fauna that is  
24 inhabiting those waters.

25 The problem of establishing  
26 silt levels, safe silt levels, is far from completely  
27 answered. Some attempt at standards have been made,  
28 and these are discussed by Mr. Doran in Appendix --  
29 and an appendix to Volume 4. There is need, however,  
30 to measure background levels of silt before



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1  
2 construction activities. I think the applicant might  
3 consider it as an insurance policy to any possible  
4 allegations. It would be only natural to want to  
5 record pre-activity levels.

6 We estimate that there will  
7 be measureable short-term increases in sediment  
8 loads. These will primarily occur in smaller streams  
9 which we define as less than 50 C.F.S. or 1.4 meters  
10 per second spring runoff. All construction activities  
11 will add to siltation levels, but road-building will  
12 be the chief contributor. The reason that the effect  
13 will be greater on smaller streams is because a  
14 greater proportion of the stream itself will be affected  
15 by any such perturbation.

16 Care, a special care must be  
17 given to maintaining bank stability. This is critical.  
18 In permafrost areas, once bank erosion starts, it is  
19 almost impossible to control without continued effort  
20 and cost, and the effects are perceived far downstream.  
21 While we expect road and other access construction  
22 to have the greatest impact on the increased  
23 silt levels, there is some concern over the construction  
24 of the 115,000 five-ton weights which are proposed  
25 to anchor the pipe. If these are built on-site, as  
26 the construction proceeds, and gravel is washed and  
27 cement waste goes into the streams, we're not concerned  
28 in the big places but in the narrow smaller  
29 streams it could have a measureable effect.

30 Fish spawning beds and



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1  
2 nursery areas that have become silted over, can be  
3 cleaned but it is an expensive and time-consuming  
4 effort and it's far better to avoid the activity than  
5 to try and clean it up later.

6 The second siltation problem  
7 originates from gravel. The project proposes to use  
8 significant quantities of gravel in construction. IN  
9 the natural state, fishes affect -- gravel affects the  
10 lives of fishes in providing a space for spawning  
11 and for protection against predators; and so it's not  
12 just gravel, but it's its size, its spacing, its  
13 packing, and the flow of water through it as well  
14 as its silt loading.

15 When gravel taken from  
16 stream beds where natural replacement is slow will  
17 and has been shown in many places to cause negative  
18 effects on fish egg production and food production.  
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1 Our concern over  
2 gravel was a heavy one originally and is still of  
3 concern to many biologists. Three or four  
4 studies done for the Government indicate that the  
5 potential quantity of gravel for the project  
6 is adequate and is available from outwash plains.  
7 If the gravel is chosen from the outwash plains there  
8 is no need to extract gravel from the stream. If so,  
9 this is fine, but if there is any removal of gravel  
10 from the stream bed itself, there is cause for  
11 concern.

12 There is a need for site  
13 specific review, on sites review of gravel removal  
14 requirements. At the moment our assessment as  
15 reported in volume IV indicates that there might  
16 be a problem in some of the rivers of the Yukon  
17 coastal slope.

18 Another source of siltation  
19 due to gravel removal is at pipe crossing sites.  
20 Such sites, when the gravel, an overburden is  
21 replaced, must be armoured and held into  
22 place, otherwise they will be scoured out again and  
23 there must be provision where the flow is strong or  
24 likely to be strong at times of the year for the  
25 introduction of rip-rap.

26 Another concern of pipeline  
27 and other crossings is to the obstruction of fish  
28 movement. Now, there are many kinds of fish movement.  
29 Fish frequently make small movements from a few  
30 hundred yards to a few miles for spawning activities





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1 and these can take place in the fall or the  
2 spring. Many fishes spawn in the spring, such  
3 as the grayling and some fall spawners might be  
4 mentioned, like whitefish. Other fish make  
5 extensive migrations, such as salmon and lamprey.  
6 Still others just move up and down and how far  
7 they move is related to the amount of food that they  
8 intake, such as pike and sucker.

9  
10 The critical thing about  
11 obstruction to fish movements is the length of the  
12 delay. If a delay occurs as an anadromous  
13 fish, like a salmon, is just coming into a river and  
14 is not quite ready for spawning by a matter of  
15 weeks, a delay of a few days or even ten days to two  
16 weeks is often not critical, but if a fish or  
17 fishes are close to full ripe spawning condition,  
18 a delay of even 24 hours can significantly  
19 reduce egg production. So, the timing of the  
20 movement of fish in relation to any delay is  
21 critical.

22 There is also in consideration  
23 of movement the time of the year other than the time  
24 of the spawning. After ice break up fish are in  
25 far poorer condition than after they have had a  
26 healthy summer of feeding and growing, that is, fish  
27 are more sensitive in the spring and in the break  
28 up time of construction is likely to have more  
29 effect on fish than early fall construction.

30 The effects of barriers are  
several and one that deserves special consideration



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1 is culverts and I realize, sir, that culverts are  
2 a pretty mundane subject, but they are extremely  
3 significant in terms of importance.

4 If the culvert is misplaced,  
5 erosion of the stream bed can result in raising the  
6 culvert relative to the water level threatening  
7 fish access. If a culvert is incorrectly  
8 placed it can also raise the upstream level, and  
9 this ponding itself can cause increased velocity,  
10 flood previously undisturbed land and if that land  
11 happens to be ice-rich, it can lead to  
12 bank collapses and continuing erosion. A wrongly  
13 placed culvert can also affect downstream areas  
14 in the way the water pours out onto the banks. An  
15 example of a misplaced culvert is the one in  
16 the slide. Now, this culvert will definitely protect  
17 the road from being washed over, but it does  
18 absolutely nothing to allow for a migration of  
19 fish at a critical moment. I will also use this  
20 example, taken south of Inuvik, to illustrate another  
21 point, that is, the stacking of culverts. If culverts  
22 are not stacked in a particular geometric fashion and  
23 one on the bottom happens to get frozen or plugged  
24 because these are shady areas and thaw out less fast  
25 than others, the water could rise above it and  
26 the culvert is then useless.

27 The freezing problem in  
28 maintenance of water level for fish movement is  
29 critical in culvert designs. There has been an  
30 enormous amount of work done on culverts all over



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1 the United States, Canada and in other countries  
2 of the world and much of this information has  
3 been collected in a recent government report which  
4 I recommend when considering terms and conditions,  
5 this document by R.L. Dryden and J.N. Stein issued  
6 by the Fisheries Service is commendable.

7 In addition to the culverts  
8 themselves being there they must be constructed in  
9 a fashion that will allow fish movement, not only  
10 depth of water, but allow the transgression of the  
11 fish through it because if it is too fast,  
12 fish cannot move through a culvert. Now, not many  
13 measurements have been made in this area, a general  
14 working guide that the Board recommends is that the  
15 speed of current through a culvert be no greater  
16 than three feet per second or .9 meters per second,  
17 but I would emphasize that much work in the  
18 area of standards is needed along these lines.





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1  
2 We don't know a great deal  
3 about sex differences, age differences, and so forth  
4 in moving through culverts. One way of mitigating this  
5 problem is to produce culverts with baffles, and there  
6 are a number of patented baffle designs worked out  
7 in conjunction with dam projects elsewhere; but  
8 baffles work only through limits. They are not a  
9 panacea for getting fish through culverts. A baffle  
10 can have a reverse effect in a high current.

11 The next area of concern  
12 to which I wish to address myself are the problems of  
13 toxic substances, and this takes the form of two  
14 questions: Test fluids and pollutants.

15 Pressure test of pipe will  
16 require extensive volumes of methanol. Because of the  
17 value of methanol, it's unlikely to voluntarily be  
18 introduced into the system, but the extent and signi-  
19 ficance of the impact of methanol on the system cannot  
20 be -- I repeat -- cannot be evaluated with existing  
21 data. Further studies are necessary on the effects of  
22 methanol on aquatic life before the method of disposal  
23 is agreed to. As you are aware, sir,  
24 sea ice becomes fresh in a matter of one or two years  
25 simply by the temperature differential between the  
26 air above the sea ice and the water below, the brine  
27 percolates out because of the temperature differential.

28 The migration rates of  
29 toxic substances through ice has not been studied for  
30 any of the potential pollutants in the Arctic, in this



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1  
2 country or the United States. There is a small amount  
3 of work has been done in the Soviet Union.

4 In terms of pollutants, no  
5 matter how well one tries, and certainly there is much  
6 evidence of trying, accidental spills are bound to occur  
7 and fish kills are to be expected. What is important  
8 is to establish contingency plans, and establish what  
9 toxins, toxic substances are going to be used. If you  
10 have the same contingency plan for every spill of  
11 every substance, it's not going to be as effective  
12 or be implemented as fast as if you dump something  
13 critical into the water.

14 The next area that I wish to  
15 discuss is the use -- that is the increased mortality  
16 rate in our model -- of fishes, domestic use, commer-  
17 cial use, and sport fishing. Some data in Volume 4  
18 indicates the extent of subsistence or domestic use  
19 fishing in the north; but such information is inadequate  
20 and we really don't know in detail to what extent the  
21 peoples of the north use the local fishes. This is a  
22 responsibility of many, and it has long been a  
23 concern. But only since the project has started has  
24 there been an increased and significant effort on  
25 measuring the extent of use. These data should be  
26 gathered again as an insurance to any alleged alle-  
27 gations of construction on fish use.

28 Commercial fisheries have  
29 been monitored by the various governments. Their  
30 responsibility has extended pre-study and will no



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doubt go on through any approved project.

Sport fishing is likely to receive substantial increase due to any increased access provided by pipeline facilities. Many people propose prohibiting fishing. My professional experience and my view is not to prevent fishing. On the contrary, the only way that one can receive reasonable estimates to assess the effect of sport fishing or any other kind of harvest on an animal is to have it done by the type of person that is actually going to carry out the activity. Scientific sampling can give us some ball park estimates, but you really don't know about sport fishing rates until you let the sport fishermen show how good or poor he or she may be. Consequently, I would suggest that sport fishing be permitted but that the activity be made use of in collecting data, so as to provide for a sound base of a fishery management.

Let me now turn to the use of explosives in the aquatic environment. This subject has received considerable attention due to oil and geological work throughout the world, and has benefited from extensive literature. If -- and I emphasize the "if" -- if explosive activity is carried out in the summer period when the waters are open to the air, that is when there is no ice seal, I have relatively little concern for fish or most other aquatic organisms. The nature of aquatic organisms is such that in preparing for the blast, a good many of the



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1  
2 organisms could be dispersed, and the nature of the  
3 explosion is such that the force falls off as the  
4 inverse square. You don't have to get very far away  
5 from a blast to have the pressure substantially re-  
6 duced. It is the negative aspect of the pressure  
7 wave that causes most of the trouble in most fish.  
8 Fish vary in their response to explosives because of  
9 their air bladder or lack of it. The air bladder  
10 is parallel to a lung, and how it's connected to the  
11 outside, some fish have an open connection, some have  
12 a closed connection, some have no air bladder at all  
13 and these three variations cause different responses  
14 in the fish to explosives. But in studies done on  
15 things as large as the Amchitka explosions down to  
16 smaller tests -- considerably smaller tests, there is  
17 good evidence that kill in aquatic organisms can be  
18 minimized with sufficient precautions, particularly  
19 with the choice of the right kind of powder.

20 The same statement cannot be  
21 made for the use of explosives in winter. There are  
22 no, to my knowledge, unclassified data on the effects  
23 on life of explosives under the ice, and those classi-  
24 fied data of which I am familiar concern physical  
25 features and not biological features of explosions  
26 under ice. Much work would have to be done before  
27 one could predict with any degree of precision the  
28 effect of explosions under a tight ice cover on  
29 aquatic life. My estimate, and it is only an estimate,  
30 is that on fishes the kill could be somewhat increased





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1  
2 and that on aquatic mammals it could be significantly  
3 increased due to the propogation effects of the waves  
4 of pressure under the ice.

5 Finally, I would like to men-  
6 tion, Mr. Commissioner, the value of the information  
7 to this project and future projects of the work that's  
8 been done on the aquatic environment. It wasn't  
9 exactly an unknown area before the project started.  
10 A lot of people have been involved for many years, but  
11 certainly the significant increase of knowledge by  
12 the company, the government, and in providing  
13 mechanisms to universities through consulting and  
14 direct grants has been significant.

15 Before summing up, I would  
16 like to return, sir, to your comments of yesterday on  
17 the energy corridor, to re-emphasize what I said  
18 earlier. In carrying out an impact assessment  
19 in the aquatic environment, one must plan for the  
20 greatest impact and speaking in a general sense now,  
21 and limiting my comments specifically to fish, if  
22 one ranks a gas pipeline as one level of danger, an  
23 oil pipeline would be three to five times greater,  
24 and in my estimation a road six to ten times more  
25 dangerous than an oil pipeline.  
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1 But in assessing  
2 these affects, in making these predictions that  
3 I have for the Borad in this area with the help  
4 of a very competent staff, some of the comments  
5 would be absolutely reversed if one had to also  
6 consider an oil line. Therefore, I emphasize  
7 that the predicions reported herein in my testimony  
8 and in the staff papers are simply not valid if  
9 we had a different set of references or assumptions  
10 on which to build.

11 If I may summarize. The  
12 overall effect of construction and operation of  
13 the proposed gas pipeline on fishes and other  
14 aquatic organisms will likely be minor. There is a  
15 probability for local, primarily short term and  
16 even some serious problems resulting from increased  
17 siltation and reduction in oxygen levels in some  
18 rivers and lakes, from increased water velocities  
19 and other activities that interfere with fish  
20 movements as well as some accidental spills of  
21 toxic substances into water courses.

22 Long term effects of  
23 fishing on this resource depend on the extent and  
24 success of future management of the stocks. The  
25 Board anticipates that the impact on water quality  
26 will be minor. In each region of the route, some  
27 streams will experience measurable short term  
28 increases in sediment loads. Concern is specifically  
29 noted of the environmental impact of large accidental  
30 discharges of oil or other toxic materials upstream



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1 or within the Mackenzie Delta which could be  
2 significant to bird populations.

3 Mr. Commissioner, this con-  
4 cludes my statement on this topic, thank you.

5 THE COMMISSIONER: Thank you.

6 WITNESS TEMPLETON:

7 A Mr. Commissioner; I  
8 would like to correct a statement that I made  
9 yesterday that we would not be filing the fish data,  
10 that accompanied both interim reports. We have since  
11 changed our mind and it has now been included with the  
12 interim reports that we have already submitted and  
13 is included in the exhibit.

14 I would like to call on  
15 Dr. Ian McTaggart-Cowan now to discuss the  
16 subject, the impact on birds.

17 WITNESS MCTAGGART-COWAN:

18 A Mr. Commissioner,  
19 my name is Ian McTaggart-Cowan. I would like  
20 now to address myself to the impact that the  
21 proposed pipeline -- cold gas pipeline project in  
22 our view is likely to have on the birds of the area  
23 that will be transversed.

24 Over half of the species of  
25 birds known to occur in Canada have been recorded  
26 in the area to be traversed by the pipeline. However,  
27 this northern part of Canada is vast in extent. There  
28 are very few habitats that are very small in  
29 area, consequently most of the species are widely  
30 distributed. We have reviewed the available data and





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1 in our judgment only about twelve species of over  
2 200 are likely to be exposed to impacts which may alter  
3 their living strategies in such a way as to reduce  
4 their total numbers or to impair their chances of  
5 survival as residents of Northwest territories  
6 or Yukon Territory in the long term. The entire  
7 avifauna has been listed and reviewed in our volume  
8 4 which has already been put in evidence.

9 We have identified three major potential sources of  
10 impact on birds, and in doing so we have used  
11 the same matrix system that was explained yesterday  
12 by Mr. Templeton. I don't propose to show photo-  
13 graphs of a whole series of unreadable red and  
14 yellow squares, as the principle has been established  
15 and the documentation has been available to you.  
16 However, I would like to refer to certain of the  
17 impacts and to outline the potential for certain  
18 damages.

19 The red squares are those which  
20 we consider to be potentially of major importance.  
21 The yellow squares are those which we expect to be  
22 of minor significance.

23 The three potential sources  
24 of impact that we have identified are pollution resulting  
25 from fuel spills, from the discharge of lubricants,  
26 flushing agents, pipeline testing fluids to the extent  
27 that it escapes into water bodies or other toxic  
28 materials that enter water which is used by water  
29 birds, to a less degree, but just as essentially  
30 as it is used by fishes, as outlined recently by



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1 Dr. Wilimovsky.

2 The second source of potential  
3 impact is the alteration of habitat so as to change  
4 its suitability for certain bird species.

5 The third and by far the  
6 most important source of impact is disturbance in  
7 many forms. Particularly, disturbance will arise  
8 from the increased use of aircraft. Now, aircraft  
9 of course have been an essential way of life in  
10 the northern parts of Canada for a great many years  
11 and most species of birds have been in contact and  
12 have to a certain extent adapted to the passage of  
13 aircraft -- usually infrequently.

14 Species of birds differ  
15 significantly in the way in which they  
16 react to disturbance. The most sensitive species to  
17 inhabit the Northwest Territories and Yukon Territory  
18 are probably the whooping crane, but its distribution  
19 is very small and the need to overfly the area is  
20 unlikely to occur. In fact, it should be scrupulously  
21 avoided. Swans and some geese are highly sensitive  
22 in the spring and in the autumn. Landing and take  
23 off on water or on land with its high noise level  
24 and movement are also disturbing under certain  
25 circumstances. The passage of ground vehicles is  
26 disturbing in proportion to the noise generated and  
27 the distance, the frequency of passage. To certain  
28 species of birds the operation of compressor stations  
29 which generate high noise is also disturbing and  
30 reduces the population of birds present.



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1  
2 Finally, the presence of  
3 man himself, particularly if he is shooting at  
4 birds, can be a disturbing factor. In general of  
5 course our game regulations require that shooting  
6 only takes place during the non-breeding season when  
7 disturbance doesn't have the double impact of not only  
8 disturbing the parents, but reducing the survivability  
9 of eggs or young.

10 Now, we have always the  
11 consideration to take into account that we have  
12 plenty of evidence from our National Parks, from  
13 other parts of the world and from other parts of  
14 our own land, that some individuals of many  
15 species can learn to tolerate a lot of noise.  
16 We have all seen mountain sheep feeding along  
17 the side of highways in Banff and Jasper. These,  
18 I would emphasize, though, are the survivors of  
19 species of animals, and I could have taken the  
20 same example from birds, which have over a long period  
21 of time adapted and been able to recoup their numbers.

22 We have no experience at all  
23 with most of the Arctic nesting species of birds during  
24 the reproductive stages of their life cycle. Thus in  
25 the absence of sound data, one must be conservative  
26 in attempting to predict and to recommend ways of  
27 moderating impact.

28 Now, in referring to  
29 moderate impact, we have defined this as when up to  
30 25% of a regional population of birds encounters the  
project component and receives mortality or distur-



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1 bance or habitat loss likely to be inimical. A  
2 defined as  
3 major impact on birds is one where more than 25% of  
4 the regional population suffers the same effects.

5 Before proceeding further, to  
6 present the details of the most important impacts of  
7 this gas pipeline proposal and our recommendations  
8 to reduce these impacts, I must voice my concern  
9 over the requirement to address piecemeal what is  
10 likely to be only the first step of a long series of  
11 environmental alterations almost certain to ensue  
12 from the government's announced corridor concept  
13 which you yourself, sir, referred to yesterday.

14 Again, I could reiterate what Norman Wilimovsky  
15 it  
16 has just said. That/is possible to predict from  
17 the results of studies done with the gas pipeline  
18 as the application has been made in mind, with  
19 some degree of accuracy. But if one has to  
20 introduce several other forms of transport, such as  
21 looping of the line in whole or in part, or  
22 the introduction of an oil pipeline or a railway or  
23 a highway, a great deal more study would have to be  
24 done and many of the things that we are now  
25 regarding as possibly acceptable would have to be  
26 regarded at this stage as unacceptable introductions.  
27  
28  
29  
30





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A second of the matrices showing potential inter-actions that could result in disturbance effects from air strips and from air transport in general, the inter-acting points and inter-acting species are listed along the top row -- swans, ducks, other geese, snow geese particularly, black brant, etc. I think they're quite readable in the projection.

One of the most interesting factors that we have to take into consideration as we monitor the possible effects of the pipeline on birds -- and I refer again particularly to the matter of disturbance -- is the very critical timing of the life cycle of many Arctic species. The Arctic summer season is short. The length of the summer season is unpredictable because some springs are late and break-up is late. Out of season snowfalls take place, the freezeup may be early, but most of the Arctic nesting species of birds have evolved a biological time-table which allows them just enough time on the average year to get their young fledged and ready for the south<sup>bound</sup> migration. I emphasize this because the migration periods and one or two other periods in the life style which I will mention are of particular importance.

During the northbound migration great flocks of swans and snow geese pass down the Mackenzie River. This one is a photograph of snow geese en route down the river. They are crowding the appearance of open water, and those of you who have



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1  
2 lived in this part of the world will know exactly  
3 how fast behind us the breakup of ice, the shifting  
4 of ice /<sup>from</sup> along the edge of the lake, the birds arrive.

5 When spring is late or freezeup  
6 is early, the snow geese return to their southern  
7 winter ranges with almost no young. The season has been  
8 so short that the young did not reach flying stage and  
9 were left behind, or the eggs didn't hatch because of  
10 flooding or other inter-actions with inclement weather.

11 Along the course of the  
12 Mackenzie River there are certain areas of particular  
13 interest, particularly along the region from Camsell  
14 Bend to Norman Wells, there are a whole series of  
15 islands and in this area also open water arrives quite  
16 early and the birds appear almost immediately that the  
17 breakup takes place. They land on the exposed portions  
18 of the islands and they rest there, feeding there, and  
19 courting there until their time clock moves them to  
20 push on north to the nesting grounds. Now one of  
21 the strange things about these birds is that there's  
22 no time to waste, and if you postpone courtship and  
23 choosing a mate until you were able to get to the  
24 nesting ground, you just never make it. So you get  
25 on with all the preliminaries as soon as you can and  
26 what goes on on these gravel bars is interesting to  
27 observe, and critically important to the species.  
28 Most of the courting, in fact the courting has largely  
29 taken place on the wintering grounds but the pair  
30 formation, the pair bonding takes place here, the



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1  
2 actual mating is very frequently, most of it takes  
3 place here on these resting islands so that when the  
4 birds hit the nesting grounds all they have to do is  
5 scratch a pile of vegetation and get busy egg-laying.  
6 They don't have any time to waste.

7 It is critically important,  
8 therefore, and we've identified by arrows certain of  
9 the areas of most critical importance, that the birds  
10 not be disturbed more than can be avoided in these  
11 areas where they are performing their courtship cere-  
12 monies and reproduction and carrying up, and we've  
13 identified in our map in Volume 3 of which this is  
14 a small enlargement, the potential impacts we show  
15 you here that the impact up at the flag on the right  
16 is in the spring only, the little red block on the  
17 left hand sequece is on the spring only and it involves  
18 swans, geese, and ducks, and it involves over-flight  
19 by aircraft. In the lower flag you see that it's  
20 only a moderate impact and it occurs largely in the  
21 autumn during the southbound migration, and again it's  
22 from over-flight by aircraft.

23 What then are our recommen-  
24 dations that may reduce the potential hazard by  
25 disturbance during the northward movement?

26 We have a number of  
27 suggestions. These concern limitations of over-flight,  
28 we would like the over-flight of the islands to be  
29 avoided, during this critical spring migration period.  
30 It's relatively short, it's from open water to about





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1  
2 May 31, so it's plus or minus 30 days of period where  
3 we would prefer to have no over-flight over these  
4 critical islands, and if over-flight is essential,  
5 keep it above 2,000 feet.

6 There is another area just  
7 beyond Point Separation, that is in the southern  
8 portion of the Mackenzie Delta that is also parti-  
9 cularly sensitive, and Brackett Lake. This lake and  
10 a few others are used by northbound migrants with the  
11 same interesting problems to be avoided.

12 Next I would like to refer  
13 to the nesting and moulting of waterfowl, and the  
14 potential impact of the pipeline construction on this  
15 particular area. I want now to move to the Yukon  
16 coast and compare this to the Mackenzie Valley with  
17 reference to the potential problems that may be  
18 involved. The Mackenzie Valley is a migration route.  
19 The lakes adjacent to it are, many of them, breeding  
20 grounds, there are some excellent breeding grounds  
21 in the Rampart River area. The north coast of the  
22 Yukon is an extraordinarily rich area throughout the  
23 open water season. It's<sup>a</sup> migration route in the spring,  
24 migration route in the autumn, it's a moulting ground  
25 for birds that have raised their young, and through  
26 all these periods the birds are particularly susceptible  
27 to disturbance.

28 Many hundreds of whistling  
29 swans and thousands of Canada geese and white-fronted  
30 geese, ducks of all kinds, yellow billed and red-



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throated loons, eiders and so on and so forth, and a number of shore birds, some of them extremely rare shore birds, find their nesting grounds along the Arctic coast. In fact, the whistling swans that come down this river and nest along the North Coast of the Western Canadian Arctic, constitute between one-third and one-half of the whole eastern flyway population of whistling swans in the world. The whistling swans are divided into two flyways, one goes down to winter in Eastern United States, the other one goes down to winter in California. California wintering birds who nearly all nest in Alaska; the others nest along the area of particular concern to us.

This will pin-point some of the particular problem areas. There are some very fascinating and extremely valuable spits and off-shore islands, shallow islands along the Yukon Coast. The islands are particularly interesting and important because they provide protection for the nesting birds from foxes that might otherwise gain access and destroy nests; but they are also attracted to people that have leisure time to spare, and the disturbance can be critically important.

An illustration of the kind of spit, this is one of the major spits along the Northern Yukon Coast, is a nesting ground for eider ducks and other species. It's also a potential source of gravel and we would like to have it on record that these are not to be regarded as potential sources of



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1  
2 gravel without the most careful study of exactly where,  
3 when and how any gravel is to be removed.

4 The Mackenzie Delta is also  
5 a nesting ground for a population of waterfowl which  
6 ranges from 80,000 to 350,000. There are some 5,000  
7 breeding snow geese nest in islands off the mouth of  
8 the Mackenzie Delta. There are large populations on  
9 Richards Island and some other islands. It has been  
10 shown that disturbance, even relatively minor distur-  
11 bance around the nesting areas, reduces the population  
12 of nesting birds. The establishment of an oil well,  
13 the birds are still nesting there but the density of  
14 nesting around the area of disturbance is in the  
15 order of one-third of what it would be were the oil  
16 not there.

17 For most species this is not critical  
18 because the populations are large and the area of  
19 distribution is wide-spread. Our recommendations for  
20 reducing impact on the Mackenzie Delta bird populations  
21 and those along the Yukon coast are as follows, parti-  
22 cularly with reference to the Mackenzie Delta, that  
23 so far as we can say now, the cross-delta pipeline  
24 route is not favored by us but we haven't studied the  
25 details, because it came in after the main study had  
26 been done.

27 In an area lying north of a  
28 line joining Aklavik and Old Reindeer Station and  
29 Sitidgi Lake, that there be a flight corridor -- that  
30 there be a flight corridor established --



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THE COMMISSIONER: Excuse me,  
doctor. What's that line again? Forgive me.

A Yes, a line drawn from  
Aklavik --

Q Yes.

A -- on the west side --

Q Yes.

A -- to the Old Reindeer  
depot which is just north of Inuvik --

Q Yes.

A -- two miles down the  
main channel, and then extending that to Sitidgi Lake  
further east.

Q Toward Tuktoyaktuk.

A Towards Tuktoyaktuk,  
right. A line north of this line, there be a restric-  
tion of over-flights to defined corridors so that you  
don't have the essential traffic which I'm sure must  
pass back and forwards across the delta, spreading  
all over the delta, but you confine the disturbance  
to relatively limited and defined corridors.





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1  
2 Preferably the flights should  
3 be above 2,000 feet. I know that water landings and  
4 takeoffs you have to come below and you have to climb  
5 so this is why we suggest these definitions.

6 That we prohibit ground  
7 parties from landing on Kendall Island and from some  
8 of the off-shore nesting grounds along the Yukon during  
9 the nesting season from May 15th to August 1. I have  
10 followed the fate of the nesting colonies, which are  
11 disturbed by people, as infrequently as once a month,  
12 and under certain circumstances one visitor per month  
13 to a nesting colony of birds of these aquatic birds  
14 will lead to the almost total elimination of the crop  
15 of young, the reason being that there are predatory  
16 species constantly in attendance and when the eggs  
17 are left exposed or the young are left exposed, they  
18 immediately move in. So the constant presence of  
19 their parents covering the nest is extremely important.

20 Old Crow Flats is another  
21 area of rich potential -- this is the Mackenzie Delta  
22 -- the Old Crow Flats area is another area very  
23 similar to the two that I've referred to already along  
24 the Yukon coast and Mackenzie Delta, though much more  
25 restricted in size. But it is an area which from  
26 year to year supports about between 70,000 and 170,000  
27 nesting waterfowl so it's a rich area, and particularly  
28 for certain species. This area, so far as we know,  
29 is the main if not the only nesting ground of a rather  
30 rare goose known as the Tule goose, spelled T-U-L-E.



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1  
2 It is a form of the <sup>more abundant</sup> white-fronted goose but it is rare  
3 and we are particularly concerned that its nesting  
4 grounds not be disturbed by over-flight or other forms  
5 of disturbance.

6 A panoramic view of part of  
7 the Old Crow Flats area showing the abundance of <sup>lakes, their</sup>  
8 interbraided streams and so on that constitute the  
9 breeding grounds of these birds. There are many other  
10 species of birds that are, some of them quite common,  
11 this is the lesser sandhill crane, which are nesting  
12 in these areas, and though they are common, local  
13 populations can be completely eliminated by prolonged  
14 disturbance.

15 Our recommendations then are  
16 that low level flight corridors avoid critical water-  
17 fowl areas from May 15th to August 15th; the winter  
18 season, there is no problem.

19 Within the discussion I would  
20 apply the disturbing effect of construction activity  
21 and human presence. This can arise from disturbance  
22 effect per se, but for all ground nesting birds and  
23 particularly to colonial nesters such as gulls, snow  
24 geese and eiders, the disturbance of human presence  
25 or other factors may have double effects, particularly  
26 exposing eggs or young in the nest to chilling which  
27 may be fatal, or it can expose them to predation by  
28 gulls, yagers which are a predatory kind of gull, and  
29 ravens.

30 I'd like to refer next to



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1  
2     nesting colonies or nesting pairs of the flesh-eating  
3     birds, known as the raptorial birds in our report.  
4     These are golden eagles, bald eagles, the gyr falcon,  
5     G-Y-R, and the peregrine falcon. All of these nest in  
6     the area in which development is proposed. Now the  
7     applicant company has been well aware of the problems  
8     there, as we have compared notes during the course of  
9     the development of their plan, the pipeline proposed  
10    route has been altered slightly here and there to  
11    avoid areas where we have identified particularly  
12    sensitive sites, as far as these birds are concerned.

13                     We've no experience with  
14    the tolerance of either of the eagles or the osprey  
15    in the north to disturbance, but disturbance studies  
16    which my students and I have done further south,  
17    particularly on the bald eagle, show that an eagle  
18    that has been forced from its nest by an aircraft, the  
19    year following usually lays fewer eggs and raises  
20    fewer young than one that has been left undisturbed.  
21    We don't know the full story, but that is the observa-  
22    tion in a nutshell.

23                     The gyr falcons and the  
24    peregrine falcons are particularly susceptible to dis-  
25    turbance of any kind, and the disturbance is most  
26    important during the earliest part of the nesting  
27    season when they are building their nest, laying their  
28    eggs, and beginning the incubation. The gyr falcon  
29    begins its nesting very early and is frequently incu-  
30    bating during sub-zero weather. Thus the chasing of





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1  
2 the bird from the eggs is almost inevitably gives rise  
3 to freezing of the eggs and loss of that year's  
4 production.

5 The falcons, unfortunately,  
6 are very subject to nest robbery to provide birds for  
7 falconry. Consequently it is with the agreement of the  
8 Government of Canada that the nest sites which we have  
9 located have not been pin-pointed on the maps so the  
10 general areas in which they occur have been, and the  
11 material has been and will be made available to any  
12 constructor's should the pipeline project be approved.  
13 We emphasize that not all sites are known, so that  
14 there is work to be done here.

15 We see that there are quite  
16 easy remedies for the problem of protecting the falcon  
17 nests particularly from disturbance, and that is to  
18 detour wherever possible pipeline construction so  
19 that it passes at least 2 1/2 miles from the tradi-  
20 tional nesting site of a gyr falcon or a peregrine  
21 falcon, and to wherever possible establish flight  
22 corridors during the summer nesting period that do  
23 not pass over these particularly sensitive sites. Where  
24 it is impossible to avoid over-flights, the flights  
25 should be at a ceiling of not less than 2,000 feet.  
26 If possible also we recommend avoiding the placement  
27 of fixed facilities such as pumping stations, work  
28 camps, within five miles peregrine or gyr falcon  
29 nesting sites. Our particular concern for these birds  
30 is that the gyr falcon and the peregrine are both rare



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birds. Probably half the continent's population of peregrine falcons other than the ones along the coast of British Columbia and Alaska nest in Northern Canada and adjacent Northern Alaska, so that we have a very considerable responsibility for the survival of these birds.

Let me turn next to pollution.

Where large quantities of fuel, lubricants, pipe-testing fluids, etc, are stored, and that these may be toxic to wildlife, spills are likely. In fact they are almost inevitable sooner or later. If they are contained on land, they could occasion only minor damage. Of greatest potential importance to water birds is fuel escaping into one of the rivers or lakes, or into the Yukon coastal lagoons while large concentrations of water and shore birds are using them.

I am concerned that the presently established likely crossing sites of the pipeline across the head of the delta is very close to the delta itself. Earlier on there was a proposal that the pipeline cross further up-stream. Further up-stream, if there was a spill into the river you would have some time lead in containing it before it got into the delta. When it's almost at Point Separation

any pipeline spill is almost immediately into the delta, which is the richest waterfowl production area in the whole Mackenzie Valley. This pin-points again, using our conventional techniques, some of the most damaging areas and some of the most damaging



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influences in this particular region.

Oil on the plumage of water birds can be chemically toxic as the birds attempt to remove it by continuous preening. But the most important source of death of birds that become oiled is that they lose the waterproofing of their feathers. Water birds can only survive in cold water because the water never touches their skin. Once the waterproofing is removed, the birds die of chill just as you and I would die of chill submerged for similar periods in the same temperatures of water.

Birds also have a higher temperature so they're more subject to chill. Apart from direct physical damage, the entry of chemical pollutants into the water such as petroleum products and certain insecticides may damage food chains, and thus alter the capacity of the eco system to provide food for the birds. As Dr. Wilimovsky has emphasized, each system has some resilience, it can tolerate some impact without irreversible harm. But we know so little about northern eco systems and northern birds to recognize yet what those limits are.

Stockpile sites with river or sea access will, during pipeline construction, contain several million gallons of petroleum fuels. Operations will require a great number of transfers between different modes of transport, and from transport to storage. Each of these is an opportunity for human error that has been involved in most spills. Spills then are



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1  
2 certain to occur. We are most concerned first, that the  
3 most fail-safe procedures devisable should be promoted  
4 and enforced. Second, that where major stores are  
5 transferred to stored, containment and cleanup facili-  
6 ties equipment should be readily available.  
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1  
2 And third, that spill  
3 prevention and clean-up personnel should be readily  
4 available. Precautions should be intensified during times  
5 and at places of special vulnerability.

6 I refer to a third  
7 source of damage that is habitat alteration. This  
8 will occur throughout the right-of-way construction,  
9 borrow pits, access roads, airstrips, river crossings,  
10 pumping stations, wharf sites, etc. But as was  
11 emphasized by Dr. Bliss yesterday, this involves only about  
12 50 square miles north of latitude 60 so that looking  
13 at the whole of the Northwest Territories that is a  
14 relatively small area of land, and it is only where  
15 it involves some particularly rare habitat or  
16 rare species that we have to be concerned.

17 However, habitat  
18 alteration along the coastal route or on the  
19 Mackenzie River islands could be relatively great  
20 and more difficult to contain and repair.. Again I  
21 emphasize the sensitivity of these areas. And where  
22 Dr. Wilimovsky indicated that he would prefer the  
23 coastal route for fishes, I am sorry that I can't  
24 prefer the coastal route for birds. It is the rarest  
25 of the habitat forms in the area that we are  
26 concerned with and one of the ones most subject to damage.

27 So, there are ways of  
28 mitigating the problems that I have been referring to.  
29 Establish and enforce a strict of behaviour during  
30 construction and operation. Regard each borrow pit, for



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1 instance, as a separate mining venture which has its  
2 own built in set of plans for repairs. Locate the  
3 major fixed installations and borrow pits so that  
4 they do not impact upon particularly rare land  
5 birds or water birds. Prohibit withdrawal of granular  
6 material from critical lagoon areas and barrier  
7 islands along the Yukon coast.

8 Direct mortality of birds that  
9 occur from a number of other sources. One of the most  
10 serious is the introduction of a great many more  
11 people into the wilderness ecosystems of the north  
12 and that these ecosystems have very little capacity  
13 to accomadate the<sup>new</sup> situation. Men exploring hitherto  
14 remote areas where rare birds have survived because  
15 they were undisturbed and I refer again to the two  
16 species of falcons; men unknowingly entering the very  
17 small circumscribed nesting areas of rare birds, and I  
18 mention as an example, the buff breasted sandpiper  
19 which nests near the mouth of the Firth River,  
20 a very rare species with a very confined breeding  
21 range so far as we now know it; individuals using  
22 firearms in untouched areas in the times of year when  
23 normal use is prohibited; the robbing of falcon  
24 nests, all these are new forces to which the wilderness  
25 species have not yet adapted. Once again we have  
26 devised remedies but all of these require a high  
27 degree of dedication of the wildlife management offices  
28 a wide co-operation of the people involved because  
29 the enforcement people cannot be everywhere all the time  
30 and magistrates who treat infractions as serious



1        misdemeanors. We spell out these in detail, in  
2        our volumes which have been put in evidence, but I  
3        would like to read then a summary.

4                                This pipeline has potential  
5        for some unavoidable and a large number of avoidable  
6        effects on bird populations, through disturbance by  
7        aircraft, construction activities and human presence,  
8        from pollution, from habitat destruction and  
9        from direct mortality. Many conflicts can be reduced  
10       or eliminated by proper route selection and by  
11       location of facilities so as to avoid damage and by  
12       management of construction practices and scheduling.  
13       The major avoidable effect will be the disturbance of  
14       birds by aircraft, construction and  
15       human presence. Uncontrolled aircraft traffic  
16       would disrupt normal staging activities of swans,  
17       geese and ducks along the Mackenzie River during the  
18       spring migration. It could disrupt also the  
19       very important period in the autumn between early  
20       August and early October when the geese and ducks  
21       particularly and the swans are storing energy for  
22       the southbound migration. This takes place in  
23                                main  
24       along the Yukon / coast, at that time the  
25       snow geese in particular are notable for the  
26       large numbers of -- well, hundreds of thousands of  
27       birds that are present in huge flocks, for their  
28       very high sensitivity for disturbance, they will  
29       take flight at distances of five miles, and if they  
30       are badly disturbed during this period they may not  
     store enough energy to make the southbound





1 flight. This has been known to happen in migrations  
2 in other parts of North America. It could disrupt  
3 the normal nesting activities of swans, sandhill  
4 cranes, and other birds along the Mackenzie Delta,  
5 geese, ducks, loons and raptors in all regions. It  
6 could disrupt normal moulting activities and part-  
7 icularly it could disrupt the staging and pre migration  
8 energy storage which I have referred to.

9  
10 Disturbance by construction  
11 activities and human presence could affect nesting  
12 birds, particularly the falcons and it could disrupt  
13 traditional colonial nesting birds such as the black  
14 brant, the eiders, gulls, terns or again the  
15 traditional fall staging of the snow geese on the  
16 Yukon coast. Unregulated autumn barge traffic  
17 within the coastal lagoons of the Yukon coast would  
18 disturb thousands of moulting ducks with attendant  
19 energy lots. The noise of operating compressor  
20 stations on the Yukon coast could alter traditional  
21 use of areas as a feeding and staging area by snow  
22 geese. Large fuel spills into the Mackenzie River,  
23 the Mackenzie Delta or the Beaufort Sea have the  
24 potential for widespread and large-scale destruction  
25 of water birds and their habitat. The uncontrolled  
26 use of firearms is an additional source of direct  
27 mortality.

28 The land requirements of  
29 the project represent a very small fraction of the  
30 available bird habitat. However, loss of critical



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1 nesting sites for the raptorial birds of the  
2 Yukon coastal barrier beaches, spits, lagoons,  
3 estuaries, and offshore islands, of the Mackenzie  
4 River islands and sandbars, would constitute an un-  
5 acceptable habitat loss.  
6

7 The stimulation of  
8 future development of this project and the Mackenzie  
9 Highway and the resultant complex of disturbances  
10 will be the major long-term effects of the pipeline  
11 on ornithological resources.

12 Many conflicts associated  
13 with the construction and operation are avoidable  
14 through proper construction practices and scheduling.  
15 However, the number and severity of potential conflicts  
16 on the interior alternate are considerable less than on  
17 the Coastal alternate route, making it preferred if  
18 one has to choose between these two routes.

19 That concludes my testimony on  
20 the birds, Mr. Commissioner.

21 THE COMMISSIONER: Thank you  
22 very much, sir.

23 A May I proceed next  
24 to introduce the -- Mr. Templeton has just  
25 brought to my attention that when I was testifying  
26 I said that the yellow colour indicated minor impact --  
27 that is actually the white colour. The yellow  
28 colour is moderate impact --

29 THE COMMISSIONER: Yes.

30 A the red colour is the  
major impact. I would request that that be corrected



1 in my testimony.

2 THE COMMISSIONER: Are  
3 we ready for tea?

4 WITNESS TEMPLETON; Yes, please,  
5 Mr. Commissioner.

6 THE COMMISSIONER: Well,  
7 let's stop for a few minutes then.

8 (PROCEEDINGS ADJOURNED)  
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Templeton, Adam, Bliss,  
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In Chief

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

MR. GOUDGE: Mr. Commissioner,  
Dr. McTaggart-Cowan is going to continue.

WITNESS McTAGGART-COWAN: Mr.  
Commissioner, I'd like now to address myself to our  
review of the situation as it refers to mammals in  
the area.

We have identified 63 species  
of mammals that occur in the area through which the  
pipeline would pass. Most of these, however, are small  
rodents or shrews, and they are unlikely to experience  
any significant change in abundance traceable to the  
project application.

13 mammals, however, could  
experience harmful impact as a result of pipelining  
activities on the land, and another 5 marine mammals  
could be influenced by oil pollution, by disturbance  
at sea, by under-ice explosions, blasting, and things  
of this sort; but for these we lack the information  
at this time, so that I can't be specific as to the  
seriousness of the impact on marine mammals.

I would like to direct my  
remarks regarding the impact on terrestrial mammals  
to the following three sources of impact: Direct  
killing of animals as a consequence of greatly altered  
accessibility; the development of access roads,  
supply roads, the pipeline corridor itself, will  
certainly increase the access to the area. Second,  
disturbance and harrassment, for the most part by





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In Chief

1  
2 people, ground vehicles, and aircraft, particularly  
3 the latter. Third, habitat alteration of kinds that  
4 leave the habitat less attractive to the species of  
5 mammal.

6 The same technique will be  
7 used and has been detailed in our Volume 3, here  
8 is just one slide as an example of the potential  
9 inter-action matrix for mammals. You will see along  
10 the top the names of the series of mammals that we are  
11 certain can suffer some impact. You will see down  
12 the left-hand a series of five sources of problems  
13 that can lead to disturbance.

14 THE COMMISSIONER: These are  
15 the 13 species of land mammals, are they?

16 A Yes. Now I won't go  
17 through all the matrix, Mr. Commissioner, because  
18 of the complexity of it. Again the yellow indicates  
19 moderate impact; the red, serious impact; and the white  
20 either no or very little impact.

21 For the purposes of our detail-  
22 ed impact assessment we define a moderate impact on  
23 mammals as when 10 to 25% of a regional population  
24 encounters a project component, resulting in distur-  
25 bance, loss of habitat, or death. A major impact  
26 on mammals is when more than 25% of a regional popula-  
27 tion encounters a project component with the same  
28 consequences. In the case of caribou, a moderate  
29 impact occurs when up to 25% of the population is  
30 affected with respect to movements, mortality, calving,



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1  
2 or range by a project opponent. A major impact occurs  
3 when more than 25% of the population is affected.

4 Second matrix, adding three  
5 more components, this time in the area of fuels and  
6 toxic additives to the environment. The toxic additives  
7 would include insecticides, which are known to be  
8 toxic -- I mean if certain insecticides which are known  
9 to be toxic were added to the environment.

10 This is a portion of map  
11 sheet No. 10. It shows the area around the southern  
12 part of the Mackenzie Delta. The flags on the map sheet  
13 illustrate some of the site specific concerns and again  
14 this is just given as an example. The maps in Volume  
15 3 of our report give all the details. They show here  
16 on the flag that through spring, summer, and autumn,  
17 caribou will be in contact with the project to the  
18 extent that the project could have an important impact,  
19 and that the impact is likely to arise from construc-  
20 tion, from aircraft over-flight, or from helicopter  
21 over-flight, and so on. It shows the location of a  
22 communications station and of the little model for  
23 the pipeline digger shows the actual construction to  
24 be involved.

25 The grizzly bear, the  
26 standing goose, the migrating waterfowl again indicate  
27 symbolically the kinds of problems that we have al-  
28 ready referred to with birds, I want to concentrate  
29 just now on the mammals.

30 I'd like now to comment, if



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1  
2 I may, for a few moments on the differences between  
3 the Mackenzie Valley and the Northern Yukon with res-  
4 pect to mammals. Unlike the situation that I des-  
5 cribed for the bird population, the distribution of  
6 all the larger species of mammals differ greatly  
7 between the Mackenzie Valley proper and the Northern  
8 Yukon. It is true that moose and beaver are dis-  
9 tributed very widely throughout the entire pipeline  
10 area, though there are great differences in abundance  
11 from place to place. Muskrat populations are concen-  
12 trated in the major wetland areas such as the Mackenzie  
13 Delta itself, the Old Crow Flats, the lakes between  
14 ARctic Red River and Travaillant Lake, between Great  
15 Bear Lake and Brackett Lake and so on.

16 On the other hand, caribou  
17 occur now only in small numbers and irregularly in the  
18 Mackenzie Valley itself. The Mackenzie Valley really  
19 divides the caribou population of Northern Canada into  
20 two parts which have very little communication with  
21 each other. The permanent populations in the  
22 Mackenzie Valley have long since been exterminated.  
23 The barren ground caribou, however, is extremely  
24 abundant in the Northern Yukon where the Porcupine  
25 herd constitutes one of the last major herds in North  
26 America. It's certainly one of the four largest herds  
27 of caribou in the world, and it's one of the great  
28 wildlife spectacles of the world in terms of a spectacle,  
29 if I can depart, I am sure I'd be accused of emotional-  
30 ism for a moment, it's a spectacle the equivalent to





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1  
2 the great herds of wildebeests and zebras on the  
3 Sarangetti Plains of Africa, for which thousands of  
4 people travel hundreds of thousands of miles to see.

5 The grizzly bear, the wolver-  
6 ine, the martin, the wolf, the Dall sheep are pre-  
7 dominantly in the Yukon section, not in the Macken-  
8 zie Valley section, though some of these do occur  
9 such as the martin in the Mackenzie Valley, the wolver-  
10 ine in the Mackenzie Valley, and some wolves.

11 These points are important  
12 to appreciate for they mean that so far as mammals are  
13 concerned, a pipeline could be constructed up the  
14 Mackenzie Valley with far less potential impact than  
15 one across Northern Yukon.

16 Killing of animals by man is  
17 usually associated --

18 THE COMMISSIONER: Excuse me.  
19 When you say "Northern Yukon" now, having regard to  
20 what you said about the Porcupine caribou herd, you  
21 are excluding any route across the Yukon, you're  
22 not differentiating between the interior or the  
23 coastal routes?

24 A I'm referring to the  
25 difference between either of the routes that we have  
26 been asked to consider, across the Northern Yukon, and  
27 the route up the Mackenzie Valley. The potential for  
28 damage is quite different in the two areas.

29 Q All right.

30 A In part because of the



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1  
2 long residence by a great many men in the Mackenzie  
3 Valley, and the very small human population which has  
4 been present in the Northern Yukon. In large measure  
5 there's just the one community at Old Crow, and that  
6 has been the area of concentrated human activity,  
7 though people have spread out, supply camps and  
8 prospecting and so on elsewhere.

9 Q Could I just stop you  
10 for a minute?

11 A Yes sir.

12 Q Are you saying that  
13 -- you said a moment ago that the caribou in the  
14 Mackenzie Valley had long since been exterminated,  
15 that is those who regarded it as their habitat.

16 A Yes.

17 Q That is essentially  
18 owing to human activity, is that --

19 A That is what we believe.

20 Q And the absence of  
21 significantly human activity in the Northern Yukon is  
22 why you still have the Porcupine herd there?

23 A Yes sir.

24 THE COMMISSIONER: Well, have  
25 you got a note of that, Mr. Hollingworth? Mr. Holling-  
26 worth represents Foothills.

27 A I'll return to that,  
28 Sir.

29 The killing of animals  
30 by man is usually associated also with disturbance,



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McTaggart-Cowan  
In Chief

1  
2 but in this section on killing I will confine myself  
3 to the impact of killing directly, mainly looking along  
4 a rifle barrel. Caribou, moose and Dall sheep have  
5 been used as traditional sources of food by the Indian  
6 population and the Inuit population, and by other  
7 Canadians living in the northern regions. There has  
8 also been a small killing arise by sport hunting by  
9 outsiders, particuarly in the Yukon. Grizzly and polar  
10 bear have been killed for their pelts, and sometimes  
11 out of fear. Wolf, wolverine and other fur-bearing  
12 flesh-eating mammals are taken for their furs. Beaver  
13 and muskrat provide good fur and good food also.  
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Let me turn to the caribou.

The porcupine herd of barren ground caribou is the dominant element in the large wildlife of the Yukon. The herd includes about 100,000 animals. Most of which migrate twice a year from a summer range on the coastal plain of the western Yukon and eastern Alaska to winter ranges mainly south of the Porcupine River in Ogilvie Mountains and in along the eastern edge of the Richardson Mountains. Typical of the barren ground caribou are the year to year changes in the <sup>precise</sup> / areas used in summer and in winter and while migrating. Caribou do change their routes and they change the places where they are at any one given time, but the general areas that I have spelled out for summer and for winter are maintained.

This herd has had only limited contact with man. The only native community in its range is Old Crow; the summer and winter ranges are remote from other settlements except for some years when the eastern edge of the herd can be reached from the lower Mackenzie Valley and hunting parties for many, many years have gone out from McPherson and even from Aklavik and other settlements into the adjacent mountains to get winter meat. In consequence, the herd has been subject to little killing. So far as we can determine, the annual kill by man from this herd of about 100,000 animals has been in the order of 2,500 to 4,000 animals. An inconsequential number in a herd so





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In Chief

1 large. The major protection for this herd has  
2 been its inaccessibility, and this could be destroyed  
3 as an outcome of the pipeline construction, the devel-  
4 opment of supply and service roads, and the associated  
5 increases in the numbers of people in the area.

6 Now, the barren ground  
7 caribou, in my view is living in a very interesting  
8 set of circumstances. I think that there is one  
9 other species of animal in western North America  
10 that has approximately the same problems, that is  
11 the Mountain Goat. They live in habitats  
12 which have great variation in climate, weather, from  
13 year to year, and weather has a very serious impact  
14 on the survival of the newborn young; thus some  
15 herds of caribou can go for several years with not  
16 enough calf survival to replace the natural losses  
17 of adults and the herd gradually reduces in numbers.  
18 For this reason, the hunting formally, or attitudes  
19 which we have developed and the harvesting attitudes  
20 for our domestic animals, which we have developed  
21 in contact with animals that live in more southern  
22 climates, are inappropriate for animals that live as  
23 does the caribou or the mountain goat.

24 You can expect, for instance to have an annual  
25 input of from 35 to 65% of fawns into a whitetailed  
26 deer population further south, and you could therefore  
27 take by hunting approximately that number and keep  
28 the herd turning over at a fairly normal level.

29 But if you are dealing with a species in which you  
30 may go several years with almost no calf survival or



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In Chief

1 five to seven per cent with an annual mortality  
2 of over 20% ,you can't take an annual crop of  
3 the size that you can precalculate. In other words,  
4 you have to be very conservative in your harvesting,  
5 and the harvest of the Porcupine herd has been  
6 very conservative, and it could not be pushed upwards  
7 to anywhere near a calculated, let's say 20% of the  
8 herd per year.

9 Large caribou herds that have  
10 come into <sup>intimate</sup> contact with man as a result of building new  
11 access routes have never survived in their original  
12 numbers. The Newfoundland caribou were reduced  
13 to almost extermination point. Very good management  
14 has brought them back. Certain of the herds  
15 in the -- caribou herds in Alaska were reduced very  
16 significantly when a new highway passed through  
17 their range. So that ~~the~~ killing by man is a very  
18 serious potential impact as a result of increased  
19 access to this caribou herd.

20 A second source of direct  
21 mortality can be from collision with  
22 vehicles travelling on supply or service roads.  
23 Caribou are attracted to winter roads. This impact  
24 will be present only during the actual period of  
25 construction and its impact need not be serious or  
26 long-standing unless the period of construction is  
27 long-standing, and this is what disturbs me when  
28 I hear the talk of looping, and the period of  
29 construction going on for a very long period of  
30 years ahead. Speed controls on the access roads could



1 reduce the likelihood of collision.

2 Another source of direct  
3 mortality which concerns us could take place  
4 when a migrating herd makes contact with an open  
5 pipeline trench. Exactly what happens depends upon  
6 the circumstances. If the herd has been disturbed  
7 by low-flying aircraft and is in panic, I think  
8 it is quite easy to predict what will happen, they  
9 will pile into the trench with the deaths of  
10 many. If they are travelling in heavy snow, or  
11 under severe wind with drifting the same thing  
12 might happen, so that there are many parameters  
13 which one has to specify, and to be conservative,  
14 we have asked and I will refer to this again, that  
15 when a migrating herd is approaching the open trench  
16 with strung out pipe, the strung out pipe be changed  
17 at right angles and the trench be closed. This  
18 may pose problems to the engineers that are facing  
19 a difficult timetable.

20 May I turn to moose. Moose  
21 are highly vulnerable to the year long hunting that  
22 prevails in many remote areas inhabited by man.  
23 The population has already been reduced along the  
24 Mackenzie Valley and in parts of the Porcupine Valley.  
25 Moose, however, respond to good management. Moose  
26 are probably already fully utilized wherever they  
27 have been accessible and would certainly suffer further  
28 decline in numbers if hunted from the pipeline or  
29 by large numbers of newcomers.

30 Dall sheep:

This species is extremely





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1 vulnerable to overkill and very easy to get at. It  
2 is closely confined to small areas of suitable  
3 habitat. The biggest danger arises from increased  
4 subsistence hunting. Sport hunting is usually  
5 directed towards large males and the potential  
6 damage to the herd from this is less, but not  
7 insignificant. Under present circumstances, this is  
8 in large measure considered to be beyond the law  
9 and thus uncontrolled. Increased access and more  
10 wide-spread knowledge of the whereabouts of winter  
11 sheep ranges will almost certainly result in overkill  
12 unless carefully regulated. Rights to hunt are now  
13 in the contentious area of native rights, but those who  
14 affirm these rights make no mention of the management  
15 responsibilities that must accompany them. There is no  
16 mystery about sound wildlife management; it rests  
17 on adequate data on a population's size, on good  
18 statistics on birth rates and on death rates; and the  
19 acceptance by all men that the kill from all  
20 causes must not exceed the input of yearlings, and the  
21 resolve to enforce adequate regulations to these limits.

22 Grizzly bear:

23 The pipeline route crosses  
24 areas inhabited by barren ground grizzly in the  
25 northern Yukon and near the Mackenzie Delta.  
26 The Grizzly bear is nowhere common. An estimate  
27 that we reached two years<sup>ago</sup> was that no more than  
28 1,000 animals existed in the combined areas of the  
29 Northwest Territories and the northern Yukon. The  
30 ranges of individual bears are frequently very large



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1 I personally followed one bear for 45 miles during which  
2 it didn't stop walking. The animals can  
3 travel great distances -- I was going in the same  
4 direction as the bear was --

5 The animals can travel  
6 great distances to sources of food which are  
7 seasonally available, such as fish runs, berry  
8 crops, and this kind of thing.

9 WITNESS CRAIK: Were  
10 you in front or behind?  
11 WITNESS McTAGGART-COWAN: A I was behind the bear.  
12 I wasn't walking very fast.

13 The grizzly bears of the  
14 northern areas have not been selected for man-  
15 shyness because their contact with man has been  
16 limited. -- And this is the important issue. Thus  
17 aggressive contacts, that is face to face confrontations  
18 between man and bears are more likely than they are  
19 further south where bears are used to avoiding man.  
20 Any accumulation of garbage or the inadequate storage  
21 of food where bears are present will certainly attract  
22 bears and in this event are likely to lead to the  
23 bears being shot.

24 Nowhere have grizzlies long  
25 survived the advent of an access route into their  
26 habitat except under rigorous protection such as  
27 in national parks. Grizzlies are extraordinarily  
28 vulnerable to hunting in the early spring when they  
29 first emerge from their dens onto the snow. It is  
30 extrememly easy to locate the tracks of a grizzly bear



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In Chief

1 from the air, to follow it to where it is in the  
2 snow in the early spring and to arrange for the thing  
3 to be shot.

4 Polar Bear, Wolverine and  
5 Wolf:

6 These species also can be  
7 attracted to sources of human food. The consequences  
8 are likely to lead to the killing of the animals.  
9 The Polar Bear and wolverine are relatively rare  
10 species. The Polar Bear is protected in Canada under  
11 a very interesting arrangement, whereby the total  
12 harvest is allocated to the Inuit people under  
13 arrangements which they undertake with the Government  
14 of Canada every year. Canada is also the only  
15 country now taking any polar bears.  
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Templeton, Adam, Bliss,  
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McTaggart-Cowan  
In Chief

1  
2                   The rest of       the       Arctic nations   protect  
3   them completely. The former is already under protec-  
4   tion by all Arctic nations, as I've said. Additional  
5   killings of this bear would be damaging to the local  
6   population. I doubt that the killing of wolverines  
7   would reach significant levels. Even if hunting by  
8   construction personnel is prohibited, the building of  
9   a pipeline will give access to a huge area of the  
10   Yukon within which wildlife stocks have flourished  
11   because they were inaccessible to man, and their  
12   precise whereabouts were unknown to would-be hunters.

13                   The Yukon Territory is not  
14   equipped with the basic management information, the  
15   staff to obtain this information, or to translate it  
16   into data which will be necessary for essential manage-  
17   ment regulations. If the approval is given to build  
18   this pipeline, it should be recognized that greatly  
19   increased research and management staff will be neces-  
20   sary if good wilderness wildlife areas of the Northern  
21   Yukon are to remain in anything like the condition  
22   they now are.

23                   I'd like to show you now  
24   another map sheet, this time referring to the area  
25   around the Village of Old Crow and the interior alter-  
26   nate route. The flags indicate, and the blue arrows  
27   indicate our concern that caribou on migration will  
28   encounter traffic on the Dempster Highway or in an  
29   operating construction spread, and the camps of grizzly  
30   habitat will attract the attention of bears. I might





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McTaggart-Cowan  
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1  
2 also mention that the flag away off to the right --  
3 no, I guess I've got the wrong target, no matter --  
4 indicates an area where Dall sheep can be disturbed  
5 by aircraft. This indicates again some of the  
6 impacts that we anticipate that can occur, grizzly  
7 bear impact in all seasons but winter when they are  
8 hibernating, and even then, hibernating dens during  
9 winter construction can be dug out if the areas are  
10 not avoided.

11 The flag on migrating caribou  
12 down the extreme right-hand corner indicates that  
13 it's the spring migration we're concerned with and  
14 strung out pipe and over-flight by aircraft. The  
15 grizzly bear flag indicates that it's garbage that's  
16 the main problem that's likely to occur. I've already  
17 outlined these.

18 What then can be done to  
19 reduce or remove these potentially serious impacts that  
20 I've outlined?

- 21 1. We regard it as particularly important that a  
22 strict wildlife refuge of at least two miles on each  
23 side of the pipeline right-of-way and of all access  
24 and supply roads be established. I might say that along  
25 the Alyeska Pipeline it's five miles on either side.  
26 2. That no firearms be permitted in pipeline camps  
27 or operating facilities.  
28 3. That no spring hunting of grizzly bear be per-  
29 mitted.  
30

THE COMMISSIONER: By anyone?



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Wilimovsky, Craik, Gourdeau,  
~~McTaggart-Cowan~~  
In Chief

A By anyone.

4. That the authorities generate improved game management regulations that will recognize the changed status of access to this area. This will require data gathering, interpreting, staff and the translation of these data into regulations, and to resolute enforcement.

5. That those responsible should work with all northern people to gain acceptance of the needed management restraints that will arise from the new situation.

6. With special reference to caribou, it's imperative that the total kill both natural and man-induced does not exceed the input of yearlings to the herd.

7. We urge rigorous adherence to the highest standard of garbage disposal, that is incineration of all edible wastes, proper storage of food where it will not attract wildlife. Personnel should not feed wolves and bears. Animals so fed are being served a death warrant.

8. The course of migratory movement should be monitored so that caribou encountering strung out pipe and open pipe trench can be avoided.

I would now like to turn to the second problem category, that is disturbance and harrassment. It is our judgment that the impact of disturbance and harrassment are likely to be more serious to the larger wild mammal population than direct killing.

Caribou. These animals are



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1  
2 sensitive to disturbance by any unfamiliar sight and  
3 some noise. The close overflight by aircraft can  
4 induce running, even stampeding, and lesser responses  
5 that call for great energy expenditure and other  
6 physiologicakchanges that can have varied consequences  
7 that are as yet not fully understood for caribou.  
8 Caribou generally don't flee from aircraft flown about  
9 500 feet, and this altitude should be minimum when  
10 caribou are present. However, we urge 2,000 feet as  
11 the general flight altitude.

12 I'd like to refer now again  
13 to the Yukon Coast. After the caribou population has  
14 moved north, crossing the interior route of the pro-  
15 posed pipeline, it moves onto the Arctic Coast. You  
16 can see what probably looks from the back of the room  
17 like little dotted lines, each of those little dots  
18 is a caribou migrating actively. Those indicate  
19 caribou migration routes in general. The grey area to  
20 the left is Alaska. There's no political significance  
21 to the fact that it's a grey area.

22 When the caribou reach the  
23 Arctic coast, the cows get there first and they're  
24 long advanced in pregnancy. They move onward following  
25 a general westerly direction along the Arctic coast  
26 until the birth time is reached. They then select areas  
27 which the herd has traditionally used for their calv-  
28 ing grounds for as long back as human memory extends.  
29 Sometimes these are in Western Yukon, sometimes they're  
30 in Eastern Alaska, sometimes both. It depends upon how





Templeton, Adam, Bliss,  
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McTaggart-Cowan  
In Chief

1  
2 fast the caribou have been able to move north, depend-  
3 ing upon weather circumstances.

4 During the migration they are  
5 subject to disturbance by men and machines. Caribou  
6 can tolerate the close presence of man if they have  
7 not associated man with harrassment and injury. A  
8 hunted herd develop s fear reactions at great  
9 distance. This is particularly true where hunting has  
10 been from powered vehicles, such as snowmobiles. The  
11 experience at Prudhoe Bay and Scandinavia reveals  
12 that single caribou in small groups can become used  
13 to vehicular traffic. In fact there are caribou  
14 wandering around the pipeline facilities at Prudhoe  
15 Bay. In general, though, a road of any kind along  
16 which vehicles are passing at frequent intervals is  
17 almost impassable by herds of caribou. Disturbance  
18 from this source could prevent or delay the movement  
19 of pregnant cows to their traditional calving grounds,  
20 thus exposing them to sustainable predation  
21 and forcing them to calve in areas which traditionally  
22 are apparently unsuitable and where there are likely  
23 to be higher losses of new-born calves.

24 I have already referred to the  
25 potential serious impact arising when caribou encounter  
26 strung-out pipe during -- and an operating construction  
27 spread during their spring migration.

28 Caribou can be driven from  
29 ranges where they encounter repeated disturbance, and  
30 I would like to refer to what should be a truism but



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McTaggart-Cowan  
In Chief

1  
2 seems to escape some people. Animals that are dis-  
3 placed from an area where they have lived don't go  
4 somewhere else. There is nowhere else. All areas  
5 are occupied by species if they are suitable for the  
6 species, and if the specie happens to be at maximum  
7 capacity for the range. So that we, our common human  
8 attitude that, "Oh, too bad, but it's gone, it's over  
9 the hill," it's not over the hill. It's underground.

10 Let me refer next to Dall  
11 sheep. Only one population of this species exists  
12 along the pipeline route. Another population inhabits  
13 the Canning River Valley in Alaska, but we're not  
14 supposed to be talking about that here. They are high-  
15 ly sensitive to unusual noise and harrassment by  
16 hunters and low-flying aircraft. Serious disturbance  
17 results in precipitate flight that sometimes leads to  
18 accidents. During winter the sheep are frequently on  
19 the high ridges. They're extraordinarily tolerant of  
20 deep cold, and they will seek the high windblown ridges  
21 where the grass is exposed, the snow blown away.  
22 If they are disturbed they can flee from these ridges  
23 and plunge into deep snowdrifts where they become  
24 trapped and have to struggle violently to free them-  
25 selves. This induces a greater energy expenditure  
26 than the animal sometimes is capable of, and results  
27 in increased mortality. In view of the limited area  
28 occupied by sheep, if the appropriate regulation of  
29 aircraft operation and if protection from over-  
30 hunting is assured, then there should be no serious



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1  
2 interference with sheep along the interior route, and  
3 none at all along the coastal route, because it  
4 doesn't go near sheep range.

5 So far as disturbance of  
6 grizzly bears are concerned, we simply  
7 don't know what long-term responses might be. They  
8 require rather a special combination of circumstances  
9 in which to locate their hibernating dens. Disturbance  
10 of dens through the winter is almost certainly the  
11 death of the bear. Grizzlies on open tundra or  
12 alpine terrain apparently invite the close approach of  
13 aircraft.



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1  
2 Now, I want to affirm that in  
3 many cases this low overflight by aircraft is in no  
4 way vicious in intention. You see a herd of migrating  
5 caribou, a band of sheep, a grizzly, let's go lower  
6 and see if we can get a photograph, let's have a  
7 look at them, so you veer off course and you go down  
8 lower. -- Completely ignorant of what is happening  
9 to the animal as a result of this additional energy.  
10 Grizzlies on open tundra or alpine terrain can  
11 be driven to the point of physical collapse and death  
12 by close pursuit by aircraft, prolonged harassment.  
13 Animals on the snow pursued by a snowmobile can again  
14 be driven to the point of death from complete ex-  
15 haustion. So the question there, the real issue  
16 that I am putting forward is the only safe rule is  
17 fly high and don't harass. You can interpret that  
18 any way you like.

19 Again, to emphasize some of  
20 the things that I have been saying, a close up look  
21 at the area of Mile 310 where we have identified a  
22 whole series of potential impacts, these can only  
23 be appreciated by a prolonged study of the map which  
24 has been put in evidence.

25 The caribou calve on the  
26 coastal plains and for the first 24 hours after the  
27 calf is born there is a very important period in the  
28 life cycle. This is when the cow and the calf get  
29 to know each other so well that when the cow joins  
30 a herd of 10,000 others the calf will inerringly  
find its own mother and the mother the calf. This is





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1 what the parent-young bonding period. Disturbance  
2 then can, but not always, can be serious. Once the  
3 calves are used to their mothers and have started  
4 nursing, the cows join together in small  
5 groups and as the fly season emerges the caribou  
6 in the north slope gather in immense herds, those  
7 white dots are caribou.. That aircraft was flying at  
8 the recommended height . This one wasn't, but  
9 just to give you an idea of the immense herds  
10 of caribou that gather together during the  
11 fly season. I think this large gathering is important  
12 biologically. It is the old question of protection in  
13 numbers. A given unit of land contains just so many  
14 mosquitoes and so many batflies and if all the  
15 caribou are in the same place, they share that  
16 bunch of mosquitoes. If they are spread out  
17 over thousands of acres, there would be far more  
18 flies in contact with the herd and the damage can  
19 be very serious. I have had reindeer, not caribou,  
20 but they are just a European species of the same  
21 form, killed by mosquitoes in experimental pens  
22 where they were unable to escape from them. This isn't  
23 very good advertising for the tourist resource of  
24 the Northwest Territories in the summer time, so  
25 be it.

26 Then the restraints required:

- 27 1. Avoid overflying caribou between May and October,  
28 in any event, remain above 2,000 feet.  
29 2. Prohibit harassment or herding of all  
30 species of wildlife by overflight.



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3. Make every effort to avoid placing permanent roads where they will cross migration routes of the Porcupine herd.
4. Establish and enforce mitigative procedures where caribou are using snow roads used by construction traffic.
5. Establish and enforce no hunting refuge two miles or more on either side of the right-of-way and adjacent roads.
6. Require monitoring of migratory caribou in the early spring so they can be identified before they approach an active construction spread.
7. Prohibit harassment of bears from aircraft.
8. Prohibit the pursuit of wildlife by power sleds.
9. Incinerate all garbage and store food securely. Do not feed the animals. It seems to be a sign we have seen in the zoo too.

The third concern is alteration of habitat. Alteration of vast areas of habitat occur each year through wildfire in forested areas. There are grounds to believe that these burned areas are less suitable for caribou though this is a matter of argument even among caribou specialists and that burns reduce the caribou capacity and generally improve the capacity for moose, so what is good for one is apt to be inimical to the other. Fire also destroys the habitat for all forest wildlife upon which the trappers depend. Marten, fisher, wolverine, etc. Logging and clearing will have similar effects.



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1 Destruction of forest by  
2 any means will occasion decreases in numbers of the  
3 forest inhabiting furbearers that I have mentioned,  
4 other species however, may increase, so the changes  
5 are not totally negative and one has to designate  
6 what the purpose is.

7 The main environmental hazards  
8 to beaver, muskrat , polar bears, seals and whales  
9 are those arising from major oil spills. I have  
10 discussed these under bird impacts. Beaver and  
11 muskrat populations can be particularly vulnerable.  
12 In fact, I have suggested, it has been suggested  
13 that they may even be eliminated from areas that have  
14 a dense covering of oil. Though there is some  
15 interesting new research being done by the Canadian  
16 wildlife service on the tolerance of muskrats for oil,  
17 I don't have the results of that, Sir, but I think  
18 that it will be available before the end of your  
19 hearings.

20 What do we see as essential  
21 constraints then with respect to changes in habitat?

22 1. Exercise every precaution against starting accidental  
23 forest fires. If they occur from manmade causes,  
24 as Dr. Bliss referred yesterday, and other  
25 things suggest, perhaps no attempt at suppression  
26 is immediately necessary. That is, I meant to  
27 say that if they occur from non-manmade sources,  
28 in other words, they were naturally occurring fires,  
29 then perhaps no attempt at suppression need  
30 be made.





2. Keep logging clear cuts to 300 acres or less with strips left connecting the blocks of timber. This has been found to provide for survival of good stocks of marten for the trappers.
3. Exercise unusual precautions against oil spill, Surround all storage facilities with a wall of impervious material high enough to retain 125% of storage capacity.
4. Prohibit the discharge of waste engine or fuel oil into streams, lakes or the sea.

May I now summarize my recommendations regarding the mammals.

1. Where caribou are concerned, the most important recommendation is to have an adequate monitoring program during the following construction in order to, first, be aware of the location of caribou concentrations and the progress of their migrations, to gain the data necessary to provide good regulations, to detect any changes in the caribou population or in its reproductive success.
2. Construction to cease prior to the arrival of the caribou on spring migration and the pipe trench to be filled during the passage of the herd. Similarly, autumn migration must be south of the construction spread before construction starts, or the caribou will probably be prevented from reaching their wintering ranges which in tradition they have been able to survive in.
3. Blasting in quarries must not be carried out when the post calving herds are nearby, these



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great post calving herds harassed by flies are  
extremely sensitive to disturbance.

5. Prohibit hunting, trapping or possession of  
firearms by all pipeline employees, during both the  
construction and operating phases.
6. Keep any firearms needed for camp protection  
sealed, and file a report with game authorities  
or the RCMP, whenever the seal is broken.  
This is to prevent inconsequential use of firearm  
in a camp for protective purposes.
- 7 Prohibit and penalize harassment of wildlife  
by aircraft or vehicles.
8. Limit all aircraft to a minimum elevation of  
2000 feet above ground and allow nothing less  
than straight level flight over any mammal  
concentrations.
9. Dike all fuel storage facilities with impervious  
materials to hold at least 125% of capacity.
10. Clean up spills of fuel oil or other chemicals.  
Contingency plans for cleanup are required and  
skilled employees must be available.
11. Prohibit and penalize discharge of waste fuel  
oils or lubricants on the ground or in water (all  
should be incinerated.)
12. Avoid crossing wintering, lambing, and mineral  
lick areas of Dall Sheep with pipeline roads.
13. Furnish with noise abatement equipment all noisy  
facilities within 2 miles of the Dall  
sheep winter range -- there is only the one.
14. Incinerate all garbage immediately or at least



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1 daily. Prohibit food handouts to bears, foxes,  
2 wolves, etc.

3 15. Avoid timber cutting in areas larger than 300  
4 acres or closer than five miles apart unless  
5 otherwise designated.

6 16. Establish a wolf management program with the  
7 territorial authorities.

8 17. Establish and enforce a no hunting refuge two  
9 miles or more on either side of the right-  
10 of-way and adjacent roads, and I would like  
11 to make particular emphasis here, Mr. COMmissioner  
12 that within this refuge, I would suggest, in  
13 fact I would urge that trap lines which had been  
14 occupied for the three previous years prior to  
15 construction be still permitted to continue  
16 because these are part of the livelihood of  
17 northern peoples.

18 Now, to summarize the  
19 potential impact of the gas pipeline on mammals.  
20 Marine mammals, we really don't know enough to be  
21 specific. More research is needed and I hope it  
22 will take place in connection with the Beaufort  
23 Sea project which is proceeding. Beaver and  
24 muskrat will be particularly vulnerable to oil  
25 spills that are certain to occur. In the worst  
26 case, drainage alteration and pollutants can affect  
27 only 2.6% of the beaver habitat and one-tenth % of  
28 the muskrat habitat, so neither of these are  
29 significant figures, that is the actual construction  
30 without the effect of relatively small part of the



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In Chief

1 habitat, so the construction itself so far as  
2 beaver and muskrat are concerned can be neglected.  
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Caribou could be seriously affected, as a worst case example if no regulations were adopted or if regulations were inadequate or poorly enforced the Porcupine caribou herd could be seriously depleted <sup>in</sup> between five and ten years. Regulations that prohibit hunting by pipeline personnel will also be necessary to prevent the decline in the population of moose and other animals. However, only about 1/4 of 1% of the moose habitat will be altered by pipeline construction facilities and some of the alterations will be positive, not negative.

The flesh-eaters, the grizzlies, the polar bear, wolverine, wolf, are vulnerable to accessive hunting and den site destruction. They will be attracted by edible refuse, strong food odors, and in the latter circumstances some will be killed in guise of camp protection, even though the applicant's intention is not to do so and has been so stated. In treeless areas, bears and wolves are vulnerable to harrassment by aircraft. A decline in the grizzly bear population seems to be inevitable as a consequence of construction of the pipeline. Wolf populations will decline in treeless areas unless regulations are devised and enforced. Dall sheep, especially the Mount Goodenough and Canning River population may decline owing to noise disturbance, but I think that with adequate protection, they will adapt to noise disturbance and will then recoup.

That finishes my contribution



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1  
2 on mammals.

3 THE COMMISSIONER: Thank you.  
4 Can I just ask a couple of questions before we move  
5 on, Dr. McTaggart-Cowan?

6 Q A great deal of what  
7 you said related to the Prudhoe Bay leg of this  
8 pipeline proposal. I take it that whether -- I take  
9 it that if a pipeline were built to bring gas from  
10 Prudhoe Bay to Travaillant Lake that whether you chose  
11 the prime route along the coast or the interior route,  
12 you would intercept the migration of the Porcupine  
13 River caribou herd.

14 A The interior route, the  
15 alternate route would intercept the migration. The  
16 coastal route would have little effect on the migra-  
17 tion but it would be -- it would lie close to the  
18 calving grounds. In other words, it would be running  
19 parallel to the migration. The nature of the impact  
20 would be different.

21 Q Yes. You said that the  
22 Porcupine herd was one of the last four great herds in  
23 the world, as I recall. Are any other of those herds  
24 in Canada?

25 A Yes, two others, are  
26 the -- in Central Northwest Territories and Eastern  
27 Northwest Territories.

28 Q And you said that the  
29 Porcupine herd consisted of about 1,000 animals and  
30 that --



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A 100,000 animals.

Q Yes, 100,000, forgive me, and I think you said that the people of the Northern Yukon -- Old Crow, Aklavik and Fort McPherson -- were taking about 2,500 to 4,000 a year.

A Yes.

Q And that does not deplete the herd.

A We have no evidence that that has depleted the herd. In fact the evidence suggested the herd has in recent years increased somewhat, though the earlier censuses are not anything like as intensive as the census that have been made under the sponsor's research, and under the Federal Government of Canada. Consequently we have far better data now and we're not sure that it's comparable to the previous figures. One of the problems we faced all along is the lack of background data. The proponents of the project have certainly supported far greater level of research than has ever previously been done in that area and we know far more now as a result of their activities and they must be given full marks for this. We've got a far better base now to proceed than we ever had before. But it's difficult to know what the trends are without the background.

Q Yes, oh yes; and without -- if the Prudhoe Bay leg is built, either on the coastal route or the interior route, unless there are rigorously enforced controls along the lines that you





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1  
2 have provided us with in great detail, for which we're  
3 grateful, you anticipate the depletion, if not the  
4 extinction of the herd.

5 A I wouldn't anticipate  
6 the extinction. I would anticipate the depletion.

7 THE COMMISSIONER: Well, thank  
8 you. Well, where are we now, Mr. Templeton?

9 WITNESS TEMPLETON: Mr.  
10 Commissioner, we were going to tackle a little more  
11 -- perhaps a little vaguer subject than the animals  
12 and the birds, and discuss land in its natural state,  
13 and I think this would take about perhaps 20 minutes.  
14 Dr. Wilimovsky has a watch that's calibrated to at  
15 least a tenth of a second, and will no doubt tell me  
16 if I over-shoot.

17 When you jet across Canada in  
18 an airplane on a clear day there's hardly a spot where  
19 you do not see the effects of man. The same is true  
20 of much of the Western Arctic and sub-Arctic. The  
21 halibut and the sturgeon and the bison and the prairie  
22 wool , which is a prairie grass, falcons, and some  
23 species of whales, all have been drastically reduced  
24 in my lifetime and that of my parents. Because we  
25 have changed the land so drastically in two genera-  
26 tions, it is incumbent on us to fulfill the respon-  
27 sibilities to each generation as trustee of the environ-  
28 ment for succeeding generations. Let us not take away  
29 the options of future generations to study some land  
30 that is in its natural state, to know what -- that



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1  
2 somewhere in the country there is an unused bank account  
3 of wilderness.

4 Many people are disillusioned  
5 with our society, its greed and its unnecessary con-  
6 sumption of everything that's consumable, and its  
7 wanton pollution of our environment. Many people want  
8 to know even if they never set foot on a wilderness  
9 area that there is a place somewhere that we have not  
10 altered. A rancher in Calgary that I know has joined  
11 together with others in Canada and United States to  
12 buy an inaccessible and unaltered hilltop in Montana.  
13 They have fenced it off and taken away all means of  
14 access that they could. There are no entrance gates,  
15 and that man never intends to set foot on that land,  
16 but he feels that it's important that somewhere is  
17 some prairie grassland that is not altered by man.

18 Of course the land won't stay  
19 static but it's important to him that the area is set  
20 aside in its natural state.

21 Wallace Stegner said, and  
22 I'd like to quote it:

23 "Something will have gone out of us as a people  
24 if we ever let the remaining wilderness be des-  
25 troyed, if we permit the last virgin forest  
26 to be turned into comic books and plastic  
27 cigarette cases, if we drive the few remaining  
28 members of the wild species into zoos or to  
29 extinction, if we pollute the last clean air  
30 and dirty the last clean stream and push our



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1  
2 paved roads through the last of the silence  
3 so that never again will Canadians be free in  
4 their own country from the noise, the exhausts,  
5 the stinks of human and automotive wastes,  
6 and so that never again can we have the chance to  
7 see ourselves single, separate, vertical, and  
8 individual in the world, part of the environ-  
9 ment of trees and rocks and soil, brother to  
10 the other animals and part of their natural  
11 world and competent to belong to it."

12 I don't intend to go into too  
13 much emotionalism regarding land in its natural  
14 state or show too many beautiful pictures. You have  
15 seen many of them, but I do think that it's probably  
16 worth illustrating a couple, one is the Little Belle  
17 River, that's in its natural state of white. No impact,  
18 and a natural marsh, both along the proposed route .

19 In discussing this impact  
20 of land in its natural state, we have used that  
21 term rather than "wilderness" because many people con-  
22 sider the term "wilderness" means that it is the  
23 absence of all activities of man, and with such a  
24 connotation no activities would be allowed.

25 We do not take that posi-  
26 tion but we say that there is a fast dwindling supply  
27 of land that is more or less unaltered by man, and  
28 any discussion of impact on the natural environment  
29 should weigh the impact of land in its natural state.  
30 North of the 60th Parallel the project will scar the



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1  
2 land with a right-of-way 120 feet wide and 1,300  
3 miles long. It will bring a total of 8,000 men and  
4 2,400 major pieces of equipment to the area. But  
5 compared to what will follow, this is a relatively  
6 minor effect, for the Mackenzie Highway has not  
7 already -- sorry, where the Mackenzie Highway has  
8 not already pre-set a corridor for other projects,  
9 oil pipelines, highways, possible transmission lines,  
10 the pipeline will do so.

11 Oh, I'm sorry, I'm going  
12 backwards. I want to see as much land in its natural  
13 state as I can because there's not much left.

14 This slide shows the full  
15 potential or worst case inter-action matrix with  
16 arrows pointing to the inter-action between land in  
17 its natural state and the presence of various project  
18 facilities.

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1  
2 This short version of the  
3 matrix illustrates the potential inter-action more  
4 clearly. Changes in land use will not only bring  
5 about changes in management policies, but also in the  
6 intensity of management. Any level of management tends  
7 to shift the land more and more from its natural, self-  
8 regulated system toward a man-regulated system.

9 Now I would like to elaborate  
10 a little more on the recreational use of land in its  
11 natural state.

12 The Canadian north offers an  
13 excellent potential as a unique recreation base.  
14 As the demand for outdoor recreation increases, it can  
15 be expected to play a greater role in responding to  
16 that demand. The Canadian north should not be  
17 viewed, however, as other areas throughout the rest of  
18 North American have been viewed in the past. It should  
19 be viewed as a unique and fragile environment capable  
20 of supplying a limited variety of recreational oppor-  
21 tunities and experiences that cannot be obtained  
22 elsewhere.

23 However, we have a dilemma.  
24 In a man-centred environment outdoor recreation is a  
25 legitimate use of wilderness that benefits both physi-  
26 cal and mental health. For some people a sojourn in  
27 the wilderness -- in a wilderness setting is the  
28 ultimate in outdoor recreation. Thus to many recrea-  
29 tion-oriented people, any increase in the use of  
30 wilderness areas for recreational activities represents



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1  
2 a positive impact. However, to those who are more  
3 nature-centred, the impact that the project operations  
4 and facilities will have in providing access to  
5 wilderness areas for recreational uses will be negative.

6 Air strips, roads, and cleared  
7 right-of-ways associated with the project could -  
8 by providing easier access - assist in the immediate  
9 realization of some of the recreational potential of  
10 the north. This may be construed as either a posi-  
11 tive or a negative impact, depending on the priorities  
12 of the person making the assessment.

13 In our case, we are defining  
14 impact as any action connected with the pipeline  
15 project that will permanently eliminate some form of  
16 existing or potential land use activity. Our main  
17 concern is to keep open as many options as possible for  
18 future generations.

19 Perhaps we should now list  
20 some of the sources of activities that cause envir-  
21 onmental impact.

22 Although there will be  
23 thousands of construction workers, it is the other  
24 personnel that concerns us. Senior managers, logisti-  
25 cs planners, control surveyors, support staff, and  
26 visitors, to name a few, will generally be more widely  
27 spread out and not as easily controlled. Many will  
28 have access to helicopters and fixed wing aircraft,  
29 and hence the potential to harass wildlife.

30 Another source of impact



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1  
2 will be the right-of-way cleared through the boreal  
3 forest. This unbroken 120-foot wide swath will be a  
4 permanent land-use commitment which to many people  
5 will reduce the aesthetic appeal of the land, affect-  
6 ing sight-seers, photographers, and those seeking a  
7 real wilderness experience.

8 The next slide shows a  
9 typical seismic line that I imagine everyone has seen  
10 and actually it's viewed by many people as being a  
11 sign of progress, and the impact is positive, but  
12 there are others who regard it as negative.

13 Permanent roads along the  
14 cleared right-of-way will become a permanent land-use  
15 commitment. Any permanent road, if it's accessible to  
16 the public, will remove that area from future wilderness  
17 use. Any temporary roads could have as serious  
18 effect if they continue to offer passage to vehicles  
19 after the construction phase of the project has been  
20 completed. Any road use will conflict with the  
21 pure wilderness concept.

22 Permanent facilities will be  
23 another source of impact on land in its natural state.  
24 Airfields, apart from permanently committing the land,  
25 will intensify activity in the area if opened to the  
26 public. Compressor stations, too, will permanently  
27 commit both immediate and surrounding areas because  
28 of noise and visual impact. Similarly, wharves  
29 which create access and cause a visual impact both  
30 upstream and downstream along rivers, and communication





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1  
2 facilities, though they would offer only limited land  
3 commitment, would have a great visual impact because  
4 they have to be located on high points.

5 The areas in which impact  
6 will be most severe are the unique Yukon coastal plain.  
7 I don't think there is anywhere else in the continental  
8 part of Canada that has this type of land form.  
9 Another area is the area north of the Porcupine  
10 River in the interior alternate route, and this slide  
11 shows the Old Crow Flats. This is the western edge  
12 of the Mackenzie Delta at the base of the Richardson  
13 Mountains across the undeveloped areas along the  
14 interior route west of Fort McPherson to the Yukon  
15 border and across the west of Travaillant Lake to  
16 the Arctic Red River. This particular photograph is  
17 at the base of the Richardson Mountains.

18 Then there is the white water  
19 canoe route on the Rat River from Simmit Lake to the  
20 Mackenzie Delta, and because of the proposed compressor  
21 station No. CA-09, and facilities at the mouth of the  
22 Rat River, this photograph is along the Rat River.

23 Again all areas where pipeline  
24 activities would destroy or severely alter or interrupt  
25 the movement or behaviour of big game.

26 IN summary, we feel that  
27 the major impact of this project on land in its natural  
28 state is that it will bring along other major projects  
29 and hence the invasion of wilderness by more men and  
30 more machines.



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In Chief

1  
2 That the project will be  
3 followed by others is clear from the present trends.  
4 Canada has a great demand for energy and is probably  
5 unwilling at this time to reduce its energy-consuming  
6 machines, to say nothing of modifying its heating  
7 needs. Thus there is a development-oriented accelera-  
8 tion in the energy field, acceleration that would be  
9 difficult to retard; even stabilizing the present  
10 consumption rate would be a major change in our history.

11 We have assumed that the  
12 Government of Canada wants to develop its oil and gas  
13 resources in the north. As evidence of this policy, the  
14 Government of Canada has encouraged gas and oil explor-  
15 ation since the early 1920's by granting petroleum  
16 leases and granting permits for thousands of miles of  
17 seismograph exploration lines. IN addition, the  
18 Government of Canada has taken a substantial equity  
19 position in Panarctic Oils Limited, which is exploring  
20 for gas and oil in the polar regions. One can only  
21 assume, since there is no prospect of using these  
22 resources in the north in the foreseeable future,  
23 that the present federal policy is to transport the  
24 petroleum resources to southern markets. This project  
25 is thus viewed as a link in a chain of events which will  
26 gradually reduce the supply of land in its natural  
27 state.

28 The Board recognizes that  
29 wilderness areas in their natural flora and fauna are  
30 rapidly diminishing and unless some developments and



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1  
2 actions are controlled, there will be nonorthern areas  
3 without oil drums, tin cans, broken down vehicles, and  
4 cigarette packages.

5 Man has begun to realize that  
6 more and more the real values of life are those tied  
7 with nature, and that in order to cope with the pres-  
8 sures of the modern world we need to escape from it  
9 and re-create and re-vitalize our spirit by communing  
10 with the natural world. This natural world or land  
11 in its natural state is thus related to our health and  
12 our well-being. As the pressures of exploitation,  
13 urban violence, development and population increase,  
14 how much of land in its natural state will be left  
15 to the benefit of future generations depends on what  
16 we do now. We are not pleading for a halt to popula-  
17 tion and development growth, but rather our plea is  
18 one of land use planning. We believe that this is the  
19 only recourse which can guarantee that some land in  
20 its natural state will be passed on to future genera-  
21 tions.

22 The Board accepts the  
23 principle that this generation of Canadians has a  
24 responsibility to pass some untrammled wilderness  
25 to future generations, land where the environment is  
26 in a state of natural balance without man's machine-  
27 induced modifications.

28 What is needed now is a new  
29 attitude towards development. We must cultivate the  
30 attitude that, when we are considering developments



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1  
2 of only immediate benefit, we must also weigh the  
3 need to preserve environments in their natural state  
4 for future generations.  
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1 IN conclusion, as far as  
2 the limited supply of land in its natural state  
3 as an environmental component is concerned, the impact  
4 of this or any other project is negative.

5 Mr. Commissioner, that is  
6 the end of that section and I wonder if we  
7 could adjourn now and come back after lunch because  
8 we are running a little behind time and we would  
9 like to, if you don't mind, treat some more subjects  
10 this afternoon.

11 THE COMMISSIONER: Certainly.  
12 Well, what about say, coming back at 1:30, would that  
13 be all right?

14 All right, we will adjourn  
15 until 1:30. Thank you.

16 (PROCEEDINGS ADJOURNED TO 1:30 P.M.)  
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(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

MR. CARTER: Mr. Commissioner,  
before we begin I'd like to respond to an undertaking  
which we gave on May 24th, found at page 5938 of the  
transcript. It's related to the studies that are to be  
carried on this summer with respect to the cross-  
delta alternative and the ~~est~~ of Fort Simpson route  
change. I've got a list of the studies that are being  
undertaken, and the probable completion dates, and  
I've given copies of these to Mr. Templeton, who was  
interested, and have copies available for the other  
participants.

Firstly, the geotechnical  
studies with respect to the cross-delta alternative  
are expected to be completed in final report form  
by the middle of the summer, this summer; and geo-  
technical studies on the Fort Simpson route change  
are expected to be completed in final report form  
by September, 1975. The environmental studies, I am  
advised, sir, with respect to both cross-delta and  
Fort Simpson, will take longer to be ready because  
the people in the field will be there throughout the  
summer and as long into the fall as possible; but  
their recommendations and conclusions based upon raw  
data and draft reports will be available prior to the  
end of 1975. The final reports, however, will not  
be available until early '76, January or February.

THE COMMISSIONER: Thank you  
very much, Mr. Carter.



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MR. GOUDGE: Mr. Commissioner,  
I take it, Mr. Templeton, you're prepared to resume.

WITNESS TEMPLETON: Yes.  
Mr. Commissioner, I would like now, if Mr. Gourdeau  
could speak on land and the northern peoples.

WITNESS GOURDEAU: Mr. Commis-  
sioner, in the course of its environmental studies the  
Board has looked into the native use of resources. It  
has not made any field studies, except for a one-week  
trip to native communities of the region, but it has  
used the most recently published data on harvesting  
activities in the region. The data reveals that about  
170 hunters-trappers still draw their main revenues  
from harvesting activities in the Mackenzie region,  
and more than another 500 draw partial revenues from  
same activities. The total revenues average \$1.5  
million per year.

The main results of the  
meetings we held with the people of the region were to  
confirm the fact that the significance of the land is  
not and by far limited to its economic use. Consequen-  
tly any prediction of the impact of the proposed pipe-  
line as it affects the land, must take many factors  
into consideration. Our reflection on the human  
impact of the pipeline is thus limited indeed.

I will, after a few prelimin-  
ary remarks, try to explain the rationales that have  
presided over our conclusions which appear in Volume  
1 of Exhibit 135, as to the short-term and the long-





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term impact of the pipeline on northern native people.

The land that Carson Templeton has just described this morning has a very special signification to those who have inhabited it for millenia; a signification that it is impossible for an outsider like me to accurately assess. Only those who are living the northland and in the northland could express the exact nature of their feelings.

But their attitudes towards the land are a visible phenomenon that an observer from the outside can interpret. This is, I think what one is able to do when, year after year, he comes in touch with one or another of the northern native groups.

His first observation is that the land is a word that defines the total bio-physical environment. It is the trees, the frozen soil, the wind, the water, the birds, the fish, the mammals, etc.

His second observation is that when this land is generous in game, in furs, in pelts and in meat, deep satisfaction and contentment are obvious everywhere in the native villages; when the land is ill-tempered, and when its cycles of productivity are capricious and unpredictable, deception and concern become a generalized subject of conversation.

His third observation is that while there is in all that an important element of economics, this element cannot explain everything. Far from it. Those who do not need the land any more to survive economically seem to be equally concerned about



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the behaviour of the land, especially if they still  
live within a native community.

The observer can then conclude  
as I do that the land-man relationship occupies a central place in the culture of the native northerner; that in fact it is the specific characteristic of his identity. Through this relationship people recognize themselves and generations meet together. Land-man relationship is a cornerstone of the native society.

It is recognized that in the last few decades the economic dependence of the natives towards the land has been evolving in many parts of Northern Canada. In the area to be traversed by the proposed pipeline, the proportion of native people depending on their harvesting activities to survive, and generally their degree of dependence, have both decreased. This is partly due to the population increase in absolute terms and to the new needs brought into the north by southern models and standards. However, it is also due in all likelihood to some unpredictable variations in the fur market and in biological cycles, and to other reasons. I will come back later to that subject.

For the moment what I want to retain is that the significance of the land to the native northerner of the Mackenzie and Old Crow regions goes beyond its economic meaning to them. It is an essential part of themselves, in that it underlies their philosophies, their thinking, and



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1  
2 their reactions to life. There could be some excep-  
3 tions, some native northerners for whom the land-man  
4 relationship would have been replaced by another one;  
5 maybe there will be many more in the future, but in  
6 my mind these will remain individual cases for quite  
7 long.

8 The short-term impact of  
9 pipeline construction. In order to predict the nature  
10 of the impact in the short-term, one must first try  
11 to see if and how pipeline construction will modify  
12 the land inhabited by the natives.

13 The second question will be if  
14 and how the pipeline construction will modify the  
15 relationship of man to land.

16 The construction of a gas  
17 pipeline, even buried underground will certainly  
18 modify the land to a certain degree. A stretch 100  
19 feet wide over a distance of 1,500 miles cannot but  
20 modify certain conditions of the land. Some animal  
21 habitats will be partly destroyed in the right-of-  
22 way or in the vicinity. On the whole, though, biologi-  
23 cal studies performed in the area have concluded that  
24 damage could be limited to a very low disturbance of  
25 the wildlife, provided the right precautions are  
26 taken during construction and not significantly  
27 effect the biological stock.  
28  
29  
30





The proponents of the pipeline have stated that they would exert tight control over the use of their facilities for hunting, fishing and similar activities by their employees and third parties. Supposing they discharged their responsibilities reasonably well in this regard, and supposing that governmental authorities rigorously assume their supervisory responsibilities, it can be forecast that alterations to the land will not be significant during the 5 or 6 year construction





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1 period in terms of its total biological productivity  
2 in the area to be traversed by the pipeline.

3 It is assumed that the native  
4 people themselves will not take these new  
5 opportunities to overexploit the resources. In  
6 the case of semi-professional and professional  
7 hunters, it is a reasonable assumption to make,  
8 I believe, but it should not be taken for  
9 granted that among the other natives that everyone will  
10 behave properly; an informative campaign led and con-  
11 ducted by native elders through the villages and towns  
12 in the vicinity of the right-of-way will be important  
13 to insure that collaboration of everyone.

14 The second question to be posed  
15 pertains to the alteration of the native Land-Man relat-  
16 ionship to be caused directly by the pipeline construc-  
17 tion.

18 From an economic point of  
19 view a significant number of jobs will be open to  
20 native people. In fact, during construction almost  
21 every presently unemployed native of the male  
22 labour force in the region to be traversed by the pipeline  
23 could find work during construction. This kind of  
24 work will be of a temporary nature and the pay will  
25 be high. Its attractiveness to many people should  
26 be strong. Those who will involve themselves in  
27 pipeline construction will do it for more than one  
28 reason. To some this will appear a good way to bring  
29 in cash revenues that can supplement their  
30 seasonal bush earnings; it can be expected that such



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1 motivation will be found particularly in the  
2 small native villages. By others, work on the pipeline  
3 construction will be regarded as yet another occasion  
4 for finding new job opportunities of the kind that the  
5 southern-oriented economy brings to the native  
6 Northerner. This motivation should be found particularly  
7 in bigger communities such as INuvik,  
8 Fort Smith and Fort Simpson.

9 Most of the latter category  
10 have already abandoned their day-to-day relationship to  
11 the land, although this does not necessarily mean that  
12 they have become indifferent to the Land-Man  
13 relationship or that it is no longer -- it has  
14 no longer any significance to them. But their  
15 continuing to work on the pipeline should not produce  
16 any additional significant effect on their relationship  
17 to the land. They are now used to taking what is  
18 being offered to them and make the best of it. Those  
19 among them who will be satisfied enough  
20 with their work to stay with it, will find in it an  
21 opportunity to help themselves and their  
22 families. Will they be in the majority? Maybe  
23 not ... However, in view of what is currently going on  
24 in other parts of the Canadian north, namely the  
25 Panarctic venture in the Canadian Archipelago, I think  
26 the number who are satisfied could be a sizeable one  
27 if proper approaches were taken by the employer  
28 for what concerns their recruitment and their requirements  
29 as individuals and members of their families.

30 As to those who will consider



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1 pipeline work as a complement to their bush revenues,  
2 the impact they will feel could be diverse. The in-  
3 teresting wages they will earn will be partly used by  
4 some of them to better equip themselves for trapping,  
5 hunting and fishing; this should be the case particu-  
6 larly for those who are 30 years of age and over, and  
7 are considered as semi-professional or professional  
8 "hunters." Under that age, though, it can be  
9 expected that many could have difficulty returning to  
10 traditional activities as a basic occupation after a  
11 few years of involvement in waged and salaried jobs--  
12 that is, if nothing changes in the Government's approach  
13 to the intrinsic value of the Land-Man relation.

14 Among the professional hunters  
15 and trappers, there will also be some who will abstain  
16 from joining in pipeline construction because of  
17 its incompatibility with their basic traditional  
18 activities or for other personal reasons. They  
19 could suffer an indirect impact from pipeline con-  
20 struction in that their revenues could look  
21 relatively small as compared to those gained by members  
22 of their village group or family who would be engaged in  
23 pipeline construction work. The prestige attached to  
24 an activity because of the revenues it engenders is  
25 something that exists among the natives also,  
26 especially among the younger generations who are  
27 exposed to southern styles and standards. The  
28 economic value of the land-man relationship has  
29 to be maintained at least to a certain degree, to retain  
30 its total meaning among the native Northerners.

From the cultural point of





1 view the Land-Man relationship, important as it can  
2 be from the economic point of view, cannot be  
3 defined outside of its cultural and  
4 spiritual context in the case of the native northern-  
5 ers. Most of their legends and traditional religious  
6 rituals are replete with references to climates,  
7 to terrestrial and aquatic mammals, to fish, to birds  
8 and to the soil itself.

9  
10 Among the cultural vestiges  
11 buried by time in the ground, some will most probably  
12 be uncovered on the occasion of pipeline construction.  
13 Already some learned representatives of our society  
14 have pressed the authorities for assurance that arti-  
15 facts and other remains will be properly handled  
16 and salvaged. The proponents of the  
17 pipeline have stated  
18 their intention to positively contribute to the process  
19 of recovery. All concerned parties seem to be convinced  
20 of the possible contribution that identification of  
21 old sites and salvage of artifacts in the region could  
22 have in tracing back the history of Man. More  
23 than others, the native people should be proud to have  
24 fragments of their history thus reconstructed.

25 In spite of that, the real  
26 impact of this is difficult to foresee in its entirety.  
27 Surely the old sites that are reconstructed will  
28 remain in the North and thus contribute to the  
29 recognition by the native people of who their  
30 ancestors were and what they  
did. This aspect of the impact is positive. On



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1 the other hand, if all important artifacts that  
2 tell the long history of the people are transported  
3 to southern parts of Canada to be displayed in  
4 museums which are de facto, in accessible to the  
5 northern natives, the impact would be quite negative.  
6 Indeed, such a procedure could not but be viewed as  
7 a spoliation of their land and of themselves.

8 But there should be enough  
9 influence brought to bear in order that archaeological  
10 findings in and along the right-of-way are  
11 displayed in the North. This would be a golden  
12 opportunity to build small museums where authentic  
13 historical collections could be seen and gradually  
14 completed as further discoveries were made, and  
15 from where some of the collections could be  
16 circulated throughout Canada, It would be unfortunate  
17 if this opportunity were missed, particularly nowadays  
18 that there are so many pledges that the north  
19 must be livened up and not kept dormant.  
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1  
2 The probable reaction of  
3 the native people to the pipeline construction. What  
4 I have been saying refers to what could be called the  
5 objective factors, those pertaining to the nature and  
6 the quality of the intervening factors. But in the  
7 final analysis, the most important question to address  
8 in the case of the short-term impact assessment of the  
9 Mackenzie Gas Pipeline construction is how the native  
10 people are likely to react to it. This question  
11 could seem to be difficult to answer in normal develop-  
12 ment schemes. But the construction of a pipeline in the  
13 Canadian north cannot be viewed by the natives as a  
14 normal development, and this is so for four main  
15 reasons.

16 The first one is that until  
17 recently the native people considered that their  
18 ownership of the land was not questioned. They could  
19 decide by or between themselves what part of the land  
20 they would use for trapping, hunting and fishing, the  
21 only activities economically rewarding in the north.  
22 The outsiders who came, first the traders and then  
23 the missionaries, did not try to intervene with these  
24 accepted prerogatives. True, in the last 60 years  
25 things have gradually changed, but it is only in the  
26 last decade that some of the natives started to realize  
27 that outsiders could use the land for other purposes,  
28 like mining and exploration, and that these new acti-  
29 vities could limit their perceived ownership of the  
30 land.





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The second reason is that, through better knowledge of consequences of new development gained from observing mining, hydro - electric and exploration activities, the northern natives can perceive the eventual effects of the dominant society's use of northern resources. It means the gradual disappearance of animals and the suppression of traditional activities. Since the land was the only possession they had in the first place, what will be left to them?

A third reason is the experience that the Alaskan natives have just been living and of which northern natives of the region are well aware. Before the huge development of the petroleum reserves could go on in Alaska, the U.S. Government found it necessary to come to agreement with the natives, to recognize their entitlement to one-third of the state, and to recompensate them for what it took as public property. Moreover, this historical event has just been followed by the agreement in principle reached last November by native northerners and the Quebec Government, with the blessing of the Federal Government of Canada.

A fourth reason is the Nishka case, the net impact of which I think has been to force the most skeptical policy-makers to re-examine their one-sided interpretation of the aboriginal rights. Leaders of northern native, northerners are aware of this, as well as their consultants, and





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1  
2 it has added a strong element in their plea for the  
3 recognition of their own aboriginal rights.

4 Under these circumstances,  
5 it can be expected that the settlement of the native  
6 land claims will act as a determining factor in the  
7 impact of pipeline construction on the northern native  
8 people in the Old Crow and Mackenzie regions.

9 If an equitable land claims  
10 settlement is not agreed upon before the construction  
11 starts, the native people will most probably react  
12 quite negatively to the pipeline, as a group. Their  
13 common feeling will spread among individuals, as it  
14 did in the huge James Bay project where even the few  
15 Indians who had joined construction work of Hydro-  
16 Quebec in the earlier stages, eventually decided to  
17 withdraw. Today, none of them are working on the  
18 project and the situation will remain like this as  
19 long as a final settlement of the land claims has not  
20 been achieved. Moreover, it is far from being assured,  
21 in my mind, that the participation of the Indians in  
22 the James Bay project will not have been irremediably  
23 jeopardized in the short-term because of the delays  
24 in the reaching of an agreement on the settlement  
25 of the land claims.

26 However, the merit of the land  
27 claims settlement will not be principally to involve  
28 natives in the pipeline construction. Neither could it  
29 be expected that its acceptance would automatically  
30 attract them to pipeline work. A lot of other factors



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1  
2 will enter into consideration. The real effects of an  
3 equitable settlement are indeed much broader because  
4 of the connotation such a settlement has in terms of  
5 their dignity, liberty, and other human and economic  
6 considerations. The natives consider the settlement,  
7 as many of their leaders have repeatedly said it, as  
8 a major instrument permitting them to play an active  
9 role in their own evolution. In that perspective  
10 it can be forecast that the settlement would allow the  
11 objective factors of the intervention to fully play  
12 their role during the construction phase of the pipe-  
13 line, i.e. the new jobs created, to be partly filled  
14 by native workers; the training opportunities to be  
15 taken by a good number of them; the ancillary enter-  
16 prises to attract those among them who want to join in  
17 the mainstream of North American economy.

18 Conclusion. Our Board has  
19 concluded that in the short-term the overall impact of  
20 the proposed Mackenzie Pipeline on the northern native  
21 residents would be positive, provided an equitable and  
22 satisfying land claims settlement is reached before  
23 the construction starts.

24 As for the other impact  
25 predictions made by the Board, this one was made in  
26 consideration of the fact that the pipeline company  
27 will abide by its pledges; in this case that it  
28 will prevent any destructive action with regard to wild-  
29 life, and that it will respect the cultural and social  
30 requirements of its northern native employees.



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1  
2 To what degree will the short-  
3 term impact be beneficial? This, we think, will be  
4 directly proportional to the practical attitudes  
5 adopted by the three parties involved: The company,  
6 the government, and the natives themselves.

7 For instances, if the company  
8 establishes patterns of recruitment that fully respect  
9 the natural prestige of native leaders; if it adopts  
10 certain procedures to facilitate the relations of its  
11 native employees with their families and offers a  
12 flexibility that permits those who want to continue  
13 their harvesting activities and still be able to find  
14 work in their idle time with the pipeline construction;  
15 if it puts into effect certain mechanisms that will  
16 permit its native employees to save money, then the  
17 degree of the positive effects could be significantly  
18 augmented.

19 As well, the role of the  
20 governments will be important. If they find a way to  
21 give meaningful responsibilities to the natives in  
22 a certain number of supervisory functions; if they  
23 support the efforts of native co-operatives and other  
24 enterprises that will try to draw some benefits from  
25 the pipeline construction; if they give special and  
26 urgent attention to helping native communities profit  
27 by the infra-structures put up on the occasion of the  
28 pipeline, they could also significantly increase the  
29 degree of the beneficial impact.

30 The long-term impact. The





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1  
2 nature of the long-term impact of the pipeline is  
3 a theoretical one. In practice the long-term effects  
4 of the pipeline will surely not be confined to those  
5 of a trunk line laid down in the ground. Eventually  
6 the effects will be those of a tree, or a double trunk  
7 also, the branches of which will feed a series of  
8 industrial activities that will change the whole phy-  
9 sical and economic pattern of the region. In the  
10 process the native use of resources will occupy a  
11 diminishing place in the economy of the people, and in  
12 all probability the number of native harvesters will  
13 stabilize at a level commensurate with biological  
14 productivity, and largely dependent on the policies  
15 set up to maintain the harvesting activities economi-  
16 cally feasible. Assuming this kind of future trend, it  
17 can be expected that an increasing proportion of native  
18 northerners will be involved in wage and salaried  
19 activities, in enterprises related to general northern  
20 development, in technical skills and in professions  
21 of the type found in the general economic and cultural  
22 life of North Americans.

23 To predict the quality of the  
24 long-term impact of the pipeline on the northern people,  
25 it would be necessary to know how the various forces  
26 of development will interact to affect the condition  
27 of the northern man, and then try to assess his long-  
28 term reaction to the changing situations. This is  
29 largely impossible because too many unknowns are  
30 confronting us, and it is why the Board concluded



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1  
2 that the quality of the long-term impact of the pipe-  
3 line is impossible to predict.

4                   However, ~~there~~ exists a  
5 consensus among the observers of the northern scene,  
6 including many native leaders who have repeatedly  
7 expressed it, that in the main the quality of the  
8 long-term human impact of northern development will  
9 depend on the possibility of native people playing  
10 an active role in it without losing their cultural  
11 identity. Any abrupt departure from this general  
12 approach would mean uneasiness, maladaptation,  
13 frustration and conflictual situations, the effects  
14 of which could last for quite a long period of time  
15 as it has happened at other latitudes in North America.

16                   It is reasonable and realistic  
17 to expect that in their acculturative process, which  
18 is already engaged and will be precipitated by the  
19 pace of northern development, the natives could retain  
20 their cultural identity or at least the essential  
21 characteristics of it. I do not think the answer can  
22 be a simple "yes" or "no".

23                   There is nothing in the  
24 cultural identity of a people which forbids it to  
25 change. On the contrary, any human culture seems  
26 to contain in itself an inherent capacity to evolve  
27 over time. But when the culture loses its main  
28 characteristics all of a sudden       under pressures from  
29 outside, it does not evolve, it is broken. There  
30 is a term commonly used to identify this phenomenon,



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1  
2 "cultural genocide". When a culture gradually acquires  
3 the elements that permits its tenants to adapt to  
4 changing realities it is called "cultural evolution".  
5 There is a big difference between these two phenomena  
6 and it essentially relates to the timing element.

7 When one looks at present  
8 northern development, one cannot but be struck by the  
9 fact that its pace will be more and more effected  
10 by considerations that did not exist just a few years  
11 ago. In Alaska, environmental considerations and  
12 land claims settlements have caused considerable  
13 delays in the granting of a permit for oil transporta-  
14 tion; inCanada the requirements for environmental  
15 studies and for consideration of social and cultural  
16 issues have also caused the postponement of important  
17 decisions concerning northern development. I think  
18 this new trend is irreversible, and will give northern  
19 native people an opportunity to evolve gradually  
20 rather than cause them to disappear culturally.

21 A fundamental condition for  
22 the gradual evolution of the native people will be the  
23 preservation of the land-man relationship, not just  
24 because it represents today a basic cultural element,  
25 but because of its predominant role in the integral  
26 development of the north. Indeed, the interest of  
27 Canadian society in protecting the environment could  
28 be best served by an approach based on and fully  
29 respecting the long-standing relationship between the  
30 native man and the renewable resources.





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Of course, such an approach would call for a tangible recognition of the role of the northern natives, both as harvesters of resources and as managers of wildlife. It would have to be supported by Statutory rules ensuring those who want to continue their harvesting activities, within the established limitations of biological productivity, of a minimum guaranteed revenue. It would have also to be supported by new practical educational options permitting northern natives who want to engage in resources management to do so.

I have tried to cover some aspects of this approach in chapter 11 of our Volume 4 of our Exhibit 135, and will not repeat that here. I just want to conclude that among the active roles that natives can play better than anyone in the integral development of the Canadian north is the role that pertains to the management of the natural environment. If our society allows them to play that role, the land-man relationship which is an essential value of their group culture, will be perpetuated. If our society does not, and if we content ourselves with policies that would induce northern native people to profit only by salaries and wages offered on the pipeline and other southern-oriented developments, the consequences could be and will be, I think, the disappearance of native culture over the next 10 or 15 years. Thank you.

THE COMMISSIONER: Thank you,





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1  
2 Mr. Gourdeau. Before you move on, Mr. Templeton, might  
3 I ask one or two questions of Mr. Gourdeau?

4 Q You mentioned James  
5 Bay, sir. Are there any native people indigenous  
6 to the James Bay Area employed on the project?

7 A Not one last week when  
8 I left. They all disappeared because it was to manifest  
9 their solidarity, their group solidarity. There are  
10 also native people who also would like to join them,  
11 they need the money, and they know that people who  
12 are supervisors there and everything are not discussing  
13 their land title, it is to the government to decide  
14 these things with them; but it is part of their rejection  
15 of the intervention until they have been satisfied  
16 and they want to be recognized as having special  
17 privileges of what they call land rights.

18 Q How many men are employed  
19 on that project?

20 A At the present time  
21 there are 2,500 people, and it is growing gradually  
22 during the summer, it should grow to about 5,000.

23 Q What about the agreement  
24 in principle, if that is what it was, that was reached  
25 last --

26 A 27th of November, 1974.  
27 It is -- well, I think there are two main parts in  
28 this. There is the money part which is 150 million,  
29 for, over a certain period of time, and a second part  
30 which is quite more important, of course, for the



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1  
2 people as they have said it, it's about the land, so  
3 the Territory of New Quebec, as it is called in the  
4 Statute, has been divided in three kinds of lands:  
5 The lands of category 1, category 2, category 3.

6 The first category is for  
7 all practical purposes, in the case of the Indians, a  
8 reserve, and a <sup>land</sup> reserve that has been transferred from  
9 the Crown in the rights of Quebec to the Crown in the  
10 rights of the federal for the Indians.

11 In the case of the Eskimos,  
12 they are analagous to reserve, but it is not a  
13 reserve, category No. 1.

14 Category No. 2 is a very  
15 important amount of land that is reserved for the  
16 next 60 years to the activities of the people, except  
17 for exploration activities and even exploitative  
18 activities, but with their consent and on the condi-  
19 tion that if it happens they will receive money in  
20 compensation or other pieces of land as compensation.  
21 There are other features, like a very important one  
22 like the promise of a regional government where they  
23 would run themselves, and this, if it crystalizes,  
24 could be one of the most important features of the  
25 agreement in principle, of the final agreement.

26 Q Well, you said that the  
27 natives were not working on the project, one of the  
28 reasons being as a means of expressing their solidarity  
29 But if there was an agreement last November, then  
30 why aren't some of them working on the project? Is it



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--

A Well, first because it is only an agreement in principle, so strategies are still going on, and of course it would be a very bad strategy on the part of native people to say, "Well, at last it was solved and everything is O.K."

There is a second reason also, that you have in the most important Eskimo settlement in Northern Quebec, which is Povungnituk, which is very lively from a political point of view and an economic point of view, they are protesting the agreement in principle and apparently it will go to the Court for that. So it's not finalized really; it has just indicated that the Federal Government, the Provincial Government, and the leaders, which means very probably almost everybody except the Povungnituk people now, for a certain reason, have in principle accepted that they would surrender their rights at certain conditions.

Q How many native people approximately would participate in that settlement if it were to be effected?

A This will be probably made clearer when the final agreement comes. I think it is one of the subjects of discussion. It is not like in Alaska where you have so many natives living outside of Alaska, about 20,000 of them finally on a gross number of 80,000 natives.

In the case of Northern





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1  
2 Quebec there are not many living really outside the  
3 area, so it should be about 10,000 Indian and Eskimos.  
4 But there are two groups that are not involved in that  
5 because they have been moved in the '50's by the  
6 Federal Government from Fort Chimo to Seven Islands,  
7 so the agreement in principle says that it  
8 does not solve their case. In other words, it recog-  
9 nizes that they have a right to enter into an agreement  
10 with the government eventually.  
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1 THE COMMISSIONER: Well, thank  
2 very much, Mr. Gourdeau. Yes, Mr. Templeton.

3 WITNESS TEMPLETON: Mr.  
4 Chairman, that finishes the discussion of the  
5 individual impacts on the environment and I'd  
6 like to ask Dr. Ian McTaggart-Cowan to discuss the  
7 total impact of this project in addition to the  
8 cumulative impact of this project and others that  
9 will follow.

10 THE COMMISSIONER: Yes,  
11 sir.

12 WITNESS MCTAGGART-COWAN:

13 A Mr. Commissioner, in our  
14 earlier presentations, we have summarized,  
15 under ten headings, our views on the  
16 potential environmental impact of the construction and  
17 operation of a gas pipeline along either one of the  
18 two proposed routes. It is my purpose now to express  
19 our conclusion that the total and cumulative long-term  
20 impact of this project is certain to be greater than the  
21 sum of the impacts that we have predicted under the ten  
22 headings that we used. Furthermore, that it is  
23 likely to be greater than it could be, given best  
24 case assumptions.

25 We believe that those who have  
26 undertaken the environmental research on this appli-  
27 cation have identified the major components likely to  
28 experience environmental change, and that the  
29 analyses that they have produced present  
30 reasonable cases and reasonable routes to mitigation.



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1 At the same time, we aver that in a task as complex  
2 as this one -- involving landscape and animals  
3 in which there is relatively little relevant  
4 experience, it is almost impossible to foresee all  
5 likely sources of important environmental change.  
6 Furthermore, fluctuation in weather and in animal  
7 populations from year to year as a result of  
8 weather change are vast. There are differences in  
9 reproductive success, that is, the ability to  
10 reproduce and and raise their young, in years, in  
11 response to changes in the natural environment.  
12 Even some years in which there is a complete  
13 failure to bring forth young. Thus, though the  
14 research effort has been massive, its predictive  
15 value is still regrettably low. We don't have enough  
16 back up data.

17 This major project will be  
18 introducing massive alteration into a living system.  
19 This system has dynamic attributes well beyond those  
20 of its component parts which we have been looking  
21 at separately. Just as a watch has attributes that  
22 are quite different from those of the metals,  
23 jewels, plastics, etc., which go into making  
24 it. We have limited understanding only of the  
25 dynamic components of the Arctic, Sub-Arctic ecosystems  
26 within which this project will take place. Thus,  
27 it is impossible to foresee and to guard against  
28 all dynamic changes in the ecosystems that are  
29 certain to occur. In the same way, we  
30 state a similar caution concerning impact upon the



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1 social system which has prevailed and is generally  
2 referred to as a 'way of life' of northern peoples  
3 in northern communities.

4 My field of expertise  
5 is the wildlife; probably the most sensitive  
6 sector of the ecosystem. From experience  
7 elsewhere in North America and in Eurasia, it is possible  
8 to state for example, that every grizzly bear or  
9 big brown bear population that has had a transportation  
10 route developed through its range has experienced  
11 a decline in numbers. The same can be said of  
12 wild caribou populations.

13 A buried gas pipeline  
14 may have little effect on the Porcupine herd  
15 of caribou, but no one can be certain of this.  
16 We do not know enough about what it was that induced  
17 the declines in other herds that have been brought  
18 into direct contact with human development of large  
19 size. Nor how these would relate to the unique  
20 situation in the Yukon. It is certain that  
21 killing was a major part of the collapse some of the  
22 other populations which have been studied, but  
23 this killing has not been enough to account  
24 for all the declines. Some other factors have  
25 supervened that we do not yet understand.  
26 The same could be said for the population of  
27 grizzly bears and for certain other species.

28 All elements in an  
29 ecosystem are inter-related to the extent that  
30 chain reactions are easy to start. For example,





1 a significant reduction in the number of caribou would  
2 alter the relationship involving all those creatures  
3 that prey upon or feed upon carrion arising from  
4 caribou, including people. The populations of  
5 bears, wolves, wolverines, foxes and even eagles  
6 would be influenced. Some would be able  
7 to turn to alternative foods, because some are  
8 very adaptive creatures. Wolves would turn to  
9 moose to a greater degree than now, with the consequence  
10 both to moose and to wolves. The moose population could  
11 not support the number of wolves that are supported  
12 by the present population of caribou. Furthermore,  
13 the reduced number of caribou would be preyed upon  
14 more intensively and the potential for the herd to  
15 recover would therefore be reduced.

16 Declines throughout the large  
17 mammal predators and prey would persist until a new  
18 equilibrium was established. It would establish  
19 itself, but it would be a different one.

20 Declines in caribou and moose  
21 would reduce the food available to northern  
22 people depending upon wild meat.

23 The small flesh eaters  
24 turning to other/sources of food would probably compete  
25 with still smaller and more specialized ones and  
26 thus a "shock wave", if I could it express it as  
27 that, could flow through the entire system, becoming more  
28 diffuse and less likely to be detected as it went.

29 Our second reason for concern  
30 over the accumulated long-term impact arises from the role



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~~in Chief~~

1 of the initial incursion into wild lands in  
2 inducing and directing further impacts. This is  
3 particularly important in the present instance for, as  
4 a matter of announced government policy, and as you  
5 yourself, sir, drew to our attention yesterday,  
6 the first entry will be regarded as establishing the  
7 route to be used by further modes of transportation and  
8 communication.

9 Furthermore, there is the oft  
10 experienced human tendency to argue that now that some  
11 tolerable impact has been permitted, it becomes easier  
12 to argue for each successive small increment, small  
13 change. Ecan one on its own, perhaps minor, but in  
14 the aggregate inducing serious impact . I have  
15 called this destruction by insignificant increment.  
16 This process requires that proposals  
17 for initial incursions be viewed most thoroughly  
18 to determine particularly that the route designated  
19 for this project is the one least likely to be  
20 subjected to these incremental phenomena resulting  
21 from looping, from roads, from railways, from oil  
22 pipelines, etc.

23 To us, this urges very strongly  
24 for the preparation of a comprehensive land use plan  
25 for the Yukon Territory and the Mackenzie Valley area.  
26 taking into account the environmental and social  
27 components.

28 The corridor concept makes  
29 this particularly important. The Government of Canada  
30 has not even defined its concept of corridor. We



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1 hear that a gas line will be looped, over what  
2 sector? Through what period of time? Does the  
3 presence of a looping situation, the doubling of  
4 the line over a short period of time argue for  
5 an all year service road rather than a temporary  
6 roads over ice and snow that we have been talking about  
7 about? An oil line, over what part of the route?  
8 Across the Yukon to the Delta and then  
9 north, or only up the valley? All these are unknowns  
10 to us.

11 In considering the matter  
12 of the total and cumulative impact, we have been  
13 concerned also with probability of performance. In  
14 the code which we have proposed as our Volume II,  
15 there are several requirements that will in all  
16 probability <sup>greatly</sup> reduce the amount of immediate damage to  
17 the landscape and the living creatures in it that  
18 will arise from the construction of a buried gas pipeline  
19 across Yukon Territory and up the Mackenzie Valley.  
20 Important among these is the use of winter construction  
21 only. Without the construction of conventional  
22 roads. In particular this will reduce access on the  
23 long term. The applicant itself has proposed this  
24 mode of operation. However, admitting the many  
25 unknowns that will be involved in this novel  
26 engineering adventure, and also the unpredictable  
27 weather circumstances that may considerably alter  
28 the period over which a snow ice road may be usable,  
29 is it reasonable to expect that a pipelaying  
30 contractor unable to complete construction of a section





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1 of pipeline before the snow road must be abandoned  
2 will do just that? Abandon it. It would be more  
3 likely that the contractor would apply for permission  
4 to build a gravel road in order to complete the  
5 construction and withdraw equipment or to continue  
6 the use of the road after safety suggested that it  
7 should not be used. Given the high stakes involved  
8 it seems to us probable that the permission would  
9 be granted with environmental consequences well  
10 beyond what we have predicted.

11 This is only one example  
12 of the many opportunities we foresee for emergency  
13 situations to arise that would be met by bending  
14 the regulations to the detriment of the environment.  
15 The northern Yukon contains some of the choicest  
16 wild land recreational opportunities in North  
17 America. Scenically areas in the Richards Mountains,  
18 the British Mountains and the eastern parts of  
19 the Brook range are magnificent beyond description.  
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1  
2 The north flowing rivers are  
3 not canoe waters, but many of the tributaries of the  
4 Yukon, such as the Porcupine, the Bell, and the Rat  
5 River drainages, are canoe waters. Wilderness lands  
6 of prime quality. The flora and fauna and outstanding  
7 in variety and in abundance. True, the mosquitoes  
8 and other biting flies are a deterrent. The opening  
9 up of this area will have two partially counteracting  
10 influences. First, it will introduce many people to  
11 the recreational opportunities and create pressure  
12 for more extensive use. From the standpoint of those  
13 seeking wilderness recreation and those would could  
14 guide them, this will be seen as a benefit -- more  
15 people will be enjoying the resource.

16 Two, but on the other hand, they will  
17 introduce more disturbance of landscape, of wildlife,  
18 more garbage, more litter, and more physical contact  
19 with such dangerous wildlife as grizzlies, usually  
20 to the detriment in the long term to the grizzlies.

21 At the same time, wilderness  
22 is a most fragile resource, easily destroyed by  
23 over-use, inappropriate behaviour and ineffectual  
24 management. Our society to this point in time has  
25 a checkered record of managing wild land effectively  
26 for recreational purposes, and we fear that this im-  
27 pact on the environment is likely to be far more  
28 damaging at this time than if it were postponed a  
29 few years. By which time the administration of wild  
30 land recreation will certainly be much improved and



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1  
2 the education of the users more adequate. New tech-  
3 niques are now available and younger administrators  
4 familiar with these techniques are entering the Civil  
5 Service and putting them to function.

6 We are concerned also that  
7 a hurried and superficial period of specialized  
8 training of both inspectors and of field operators  
9 will lead to poor performance and thus to a total  
10 accumulative damage far greater than need be. Even  
11 with dedicated, well-trained, conscientious staff at  
12 all levels, there will certainly be a series of impacts  
13 that cannot be foreseen, nor could even be with far  
14 greater research base, than we now have. These will  
15 require prompt, effective response on an informative  
16 basis. Such can only derive from a well integrated  
17 supervisory team with clear responsibilities and a  
18 mandate to maintain or confirm what environmental  
19 activity -- that environmental activity has a high  
20 priority in that concern.

21 I would like to terminate  
22 my testimony in this matter by reading from our Volume  
23 1 two separate but relatively brief statements, one  
24 is, "What is the total environmental impact of this  
25 project?" This is on page 27,

26 "It is certain that the total environmental  
27 impact of the project will be greater than  
28 the sum of the individual impacts we have  
29 just considered. It is also certain that the  
30 total environmental impact of the project



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cannot be established quantitatively. In previous sections we discussed the probable impact of the project on some of the individual components of the environment. The components we considered do not completely represent the environment along the route, however. They are only those which appear to be significantly affected. Even if we had considered the impact of the project on a larger number of them, the sum of <sup>the</sup> impacts would probably still be less than the true total impact because of the multiplier effect, of which I've been dealing with earlier. The multiplier effect applies because the components of an eco-system are inter-related. That is an action that affects one component of the eco-system can start a set of reactions in other components. Eventually one of the reactions -- one of the reacting compounds is the initial action thereby producing a multiplier effect. An exceedingly small impact can eventually cause a disproportionately large environmental change. In this matter, any project can have an overall impact on the environment greater than the sum of the immediate impacts. As a result, it is only prudent for developers to proceed with caution, and for assessors of impact to err on the side of caution."

The second statement is on





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page 29, it is addressed to the cumulative impact rather than to the total impact.

"The cumulative impact of the project of a northern development would be much -- of much more consequence to the environment than the construction and operation of the pipeline alone. The chain of developments that follows this project and the Mackenzie Highway will produce a cumulative impact much greater than any single component of the chain, just as the discovery of oil at Norman Wells in the early 1920's brought oil exploration crews, the Canol Pipeline and road, a refinery, an airport, and winter roads, so the gas pipeline and highway will bring other developments. For instance, the highway will bring tourists, gas stations, and many other auxilliary facilities of the tourist industry. Other major developments such as mining will also be encouraged by the combination of a highway transportation system and the availability of energy. Inevitable consequences of the approval of the gas pipeline include increased access, natural gas-gathering systems, and gas processing plants. In addition there is a possibility that gas wells would be developed in the Beaufort Sea, and the discovery of significant oil quantities will necessitate an oil gathering system and oil pipelines. The



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overall effect of this chain of events is that other major facilities will become justifiable. Hydro power developments and power lines would be needed, even the possibility of a railroad system could be reviewed. Our concern about cumulative impacts becomes more meaningful when the gas pipeline and the Mackenzie Highway of the Western Arctic and sub-Arctic are thought of as a massive project, similar in impact to Canada's first railway to the west. At that time would not one have been justified in expressing concern about native claims, about buffalo herds, about land in its natural state? Did the native people get a fair land claim? Where are the buffalo, and where are the large tracts of grassland wilderness? We admit it would be impossible to preserve all the buffalo, but perhaps we could have done a better job had we looked at it in the total a long way ahead. These major predicaments have been a result of cumulative impacts and they are not directly attributable to any one development; but that does not lessen the seriousness of the impact. We believe that to lessen the effects of cumulative impact in the Western Arctic, long-range objectives and a comprehensive land use plan should be defined for the



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1  
2 region prior to the approval of any gas pipeline  
3 through the regions in question."

4 That is my testimony, sir.

5 THE COMMISSIONER: Thank you,  
6 sir.

7 WITNESS TEMPLETON: Mr.

8 Commissioner, that finishes our impact assessment.  
9 But as we've mentioned many times in the last two  
10 days, the impact is dependent on the degree of con-  
11 trol by the applicant, by the government, and by the  
12 public, and so that we would like to continue with  
13 that; but I wonder if it would be possible to break  
14 for coffee now and then spend perhaps another hour  
15 after that to discuss the existing framework of  
16 controls that is available by the applicant, the  
17 government, and the public, and then tomorrow we could  
18 start on our recommendations and go through those.

19 THE COMMISSIONER: Fine.

20 There was a passage from Mr. Horte's evidence that  
21 I wanted to refer you to on that very subject. I'll  
22 find it later on. You may have been here last Satur-  
23 day, the Saturday before last.

24 WITNESS TEMPLETON: No, I  
25 wasn't.

26 THE COMMISSIONER: Well, I'll  
27 locate it for you, but essentially he may well have  
28 come very close to the view that you have indicated  
29 on the matter of a regulatory authority. At any rate  
30 I'll locate that for you and refer you to it.





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Well, we'll take a break for  
coffee now.

(PROCEEDINGS ADJOURNED FOR FEW MINUTES)



1  
2 (PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

3 THE COMMISSIONER: Mr.

4 Templeton, when we adjourned I said that I would  
5 refer to a passage in the evidence given by Mr. V.L.  
6 HOrte on May 24th, 1975, as found in Volume 45,  
7 at page 5946 and 5947, Mr. Horte said that  
8 he was anxious that if Arctic Gas received authority  
9 to go ahead with this project that there should  
10 be one governmental authority to which Arctic  
11 Gas would be answerable during construction and  
12 he suggested that a number of government departments  
13 should relinquish their jurisdiction to the  
14 governmental authority that was to have jurisdiction  
15 over the whole pipeline project. He added that  
16 he felt that unless that was done, that is, unless  
17 there were one governmental authority to which  
18 Arctic Gas would be responsible during construction,  
19 unless that were done, he said he felt that it  
20 would be difficult if not impossible for the con-  
21 sortium to raise the money to build the pipeline.  
22 He said that he wanted -- that Arctic Gas wanted one  
23 governmental authority charged with jurisdiction  
24 over the construction of the pipeline, he added  
25 that his own preference was the National Energy Board.  
26 Forgive me for interrupting, that was the passage that  
27 I had in mind.

28 Could I just ask you one  
29 other thing, Mr. Templeton, the position of the  
30 Board, as I understand it, and tell me if I am putting



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1 it fairly, is that is it that the proposal to build  
2 the pipeline in its present form is not environmentally  
3 acceptable, is that a fair summary? If it isn't  
4 please tell me, I don't want to be unfair to the  
5 Board or Arctic Gas or anybody else.

6 WITNESS TEMPLETON:

7 A No, I think we say that  
8 it is acceptable under certain circumstances, but  
9 the circumstances are not spelled out to date so  
10 that<sup>it</sup> is acceptable. In other words --

11 THE COMMISSIONER: You have  
12 learned a lot from these lawyers.

13 (LAUGHTER)

14 A I think it was  
15 Mackenzie King that said, it was conscription but  
16 not necessarily conscription.

17 No, I think that what we  
18 mean is that with the information we had when we  
19 wrote the report, there was not sufficient controls  
20 built in by either the applicant or the Government  
21 to assure the degree of environmental change that  
22 we thought it should be limited to and so that  
23 was why we dwelt -- or will be dwelling at length  
24 from here on to spell out the controls that<sup>we</sup>  
25 think are necessary, and if all of those things  
26 are done, then we will -- we feel that it is acceptable  
27 to us.

28 THE COMMISSIONER: All right -

29 A And all we can do is  
30 say acceptable to us because when you say acceptable



1 it is only a subjective opinion of whoever says it.

2 Q Let me ask you this,  
3 one of the conditions that you would impose then  
4 I take it, from what Dr. McTaggart-Cowan said  
5 just before we stopped, one of the conditions is  
6 that there should be a comprehensive land use  
7 plan for the Mackenzie Valley and the Northern  
8 Yukon and that the construction of the pipeline  
9 should be postponed until such a plan is developed.  
10 Now, that is what I just took from what Dr.  
11 McTaggart-Cowan said, but I don't want to mis-  
12 understand that issue either.

13 A Yes, well, that is  
14 a very important point and one of the difficulties  
15 that we even have amongst ourselves is a definition  
16 of a land use plan of how far you go to spelling  
17 out specifics in a land use plan and we recognize  
18 that you can't have a comprehensive plan including  
19 a lot of detailed planning of the north in the  
20 next year or so, but it doesn't mean that you  
21 can't have a general plan on which you start to  
22 build. Now, you do that in cities. You have a  
23 general --

24 Q You do it in what?

25 A In cities --

26 Q Oh, in cities, yes,  
27 in cities.

28 A You have a plan and  
29 you -- you have a general plan first and then  
30 you gradually work it on into getting right down





1 to zoning of specific lots, but your general development  
2 plan, or whatever they call it, a land use plan,  
3 can be done in a macro-stage and as the knowledge  
4 increases and as the uses change, because there will  
5 be a great deal of pressure in the future for additional  
6 development, there will be a great deal of pressure  
7 for preserving wilderness and these forces will  
8 automatically be reflected in the land use plan  
9 as it evolves. It is never stable. It is an  
10 evolving thing depending on the needs of the  
11 people as they see it at that time.

12 Q And one of the other  
13 conditions you would impose is that there be a  
14 land claim settlement with the Native people before  
15 construction of a pipeline were to begin?

16 A Yes.

17 Q Yes, well, go ahead,  
18 forgive me for interrupting you.

19 A When we broke, we  
20 had finished our impact assessment and I mentioned  
21 that we wanted to know deal with the existing  
22 framework of control that is available  
23 to limit the impacts to those that we predicted,  
24 in other words, the probable predictions and  
25 before we get into the recommendations or terms  
26 and conditions as you mentioned yesterday, we  
27 would like to discuss what are the means of controlling  
28 the impacts if the pipeline is approved.  
29  
30



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We would like to tackle that in three sections of the existing framework for environmental protection by the applicant and the government and the public. We will try and finish that this afternoon. I'd like to introduce the subject very briefly, and to say that we have heard a great deal at these hearings about the state of technology, how far advanced it is, and how much can be accomplished as a result.

I think the first week of overview stated the technology as it applies to the north, and then panel 2 dealt almost exclusively with what could be achieved in permafrost areas, and the impression seems to be that since the technology is available, all will be well.

The applicant in effect says, "We assure you that we have the technology to do the job properly." But assurances that the technology is available does not achieve environment protection.

I'd like to give you some examples later on of the -- examples where the technology was available but perhaps wasn't used. I think Murphy's Law states simply, "that if anything can go wrong, it will go wrong," and if this law applies anywhere it applies in the north, and this isn't just a facetious comment about the north. It is quite logical when you consider the conditions under which projects are built in the north. In the dead of winter it's dark and cold and machinery breaks down, and replacements of men and machinery



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are hard to get and there's a strange sickness that affects key people, and it's called, "Urgent business in the home office." For those who are left on the job, far-off designers and environmentalists and summer trippers who told them what to do to save the environment are pretty remote, and disregarded.

Dr. Robert Legget , who has collected much of the engineering history in Canada, gave a presentation of engineering problems at the Mont Gabriel Conference of the Northern Advisory Committee, and some of the engineering mistakes in the north, he said, were repeated over and over again.

Dr. Legget kept referring to this compulsive repetitiveness as "re-discovering the wheel," and at the overview hearings here, he referred to it once again in connection with work in the north, and he said in the transcript of the 8th of March, Volume 14, page 1585, and I quote:

"All too often when you hear of the problems in the north they are problems created by people who don't know that the information is available, or if they do, they didn't go and get it, and I have myself seen to my intense regret so many examples in the north of what I would venture to call 're-discovering the wheel!'"

In other words, Canadian engineers -- and I'm one of them -- have not always used the technology available. We hope they will on this project, and I recognize





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1  
2 that there are many,very,very sincere people  
3 who have a great deal of technology and do intend to  
4 use it. But these things do go wrong.

5 So what we need to make this  
6 more than a pious hope are not assurances that the  
7 technology is available to do the job, but commitments  
8 that the technology will be used on the job. Panel 2  
9 dwelt with what could be done in permafrost  
10 areas. But there were no commitments of what would  
11 be done. Mr. Horte on behalf of the applicant certi-  
12 fied on May 23rd in Volume 44, pages 5725 to 5735, in  
13 a general way, that the applicant will go along with  
14 the methods outlined by its consultants but even so,  
15 he was still certifying what can or may be done, not  
16 what will be done.

17 Now I recognize the problems  
18 of definitively spelling out in each -- to spelling  
19 out at this time each detailed design, because they're  
20 at the preliminary design stage. They explained to  
21 us that they have a battery of techniques that they  
22 can use, and they don't know precisely which one they're  
23 going to use at each place, and I recognize that and  
24 I sympathize with them. But the question is, how  
25 can you make a judgment on environmental impact if all  
26 the evidence you have heard is what can or could or  
27 might be done and not what will be done?

28 In this dilemma when all you  
29 have before you is the assurance that the technology  
30 is available, not how it will be used, perhaps you



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1  
2 could consider the Board's method.

3 First we asked ourselves,  
4 could the pipeline be built with what is to us an  
5 acceptable degree of environmental change? We found  
6 that the answer to that question is, "yes, it could."  
7 But when we came to the next question, "will the  
8 environmental change actually be restricted to our  
9 definition of acceptability?" And the answer was, "Not  
10 likely."

11 So we set out to determine  
12 what had to be done to change the "not likely" to  
13 "likely". That's when we had to get into the whole  
14 matter of laws, regulations, duties and responsi-  
15 bilities of the applicant, the government, the gover-  
16 nmental bodies that are administering the project. So  
17 perhaps we could look at the existing means of con-  
18 trolling environmental degradation.

19 Environment protection can  
20 be considered a matter of concern to the applicant,  
21 the federal and both Territorial Governments and the  
22 public. All five, the Board believes, must fulfill  
23 their roles, each within an organized framework if  
24 the project is to have what to us is an acceptable  
25 impact on the environment.

26 The existing framework for  
27 environment protection consists of mechanisms of  
28 the applicant, which will be reviewed by Dr. Adam  
29 and me, the mechanisms of government which will be  
30



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1  
2 reviewed by Mr. Craik, and the mechanisms of the  
3 public which will be reviewed by Dr. Wilimovsky.

4 Perhaps we could turn to the  
5 question, how adequately has the applicant demonstrated  
6 that it can protect the environment?

7 In this section we will dis-  
8 cuss whether the applicant's plans and specifications  
9 adequately demonstrated that it can and will protect  
10 the environment; and in our assessment we have assumed  
11 that it is the responsibility of the applicant to  
12 document clearly the impact of his proposed action.  
13 In addition, we have also assumed that it is his  
14 responsibility to demonstrate that he is able to carry  
15 out the environmental protection measures that he  
16 proposed, and that these will be effective.

17 The applicant has demonstrated  
18 through his exhibits and through his consultants at  
19 this Inquiry, a great awareness of the technical pro-  
20 blems that must be overcome to construct and operate  
21 a gas pipeline through the Yukon and Northwest  
22 Territories. It has not, however, transferred this  
23 awareness into environmental specifications for the  
24 project. We will present one detailed example and  
25 several less detailed examples of what we mean by this.  
26 The detailed example deals with over -- aircraft  
27 over-flights.  
28  
29  
30



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The construction plan,  
section 13-A of the application deals with aircraft  
only in a general way as a means of transporting men  
and equipment to and from various sites, or for per-  
forming various tasks. No details are provided regarding  
the frequency, altitude and flight paths to the  
stockpile sites, wharves, camps, or compressor stations.  
Yet, these areas will have year-round, almost continuous  
activity during both preconstruction and construction  
phases.

The operations and  
maintenance plan Section 13.b.3.2.2.,  
pp. 13 - 14, contains some details regarding altitude  
and frequency of line patrol flights, but no  
specific commitments as to the season restrictions  
in sensitive areas.

The Environmental Statement,  
north of 60, Section 14.d.N,  
does not greatly alter the situation. In Section  
14.d.N.7.8. p. 39  
we are told, "Aircraft will be controlled through  
measures of routing, altitude and frequency of  
flights... see subsection 6 of this section  
14.d for a more detailed account of such measures".  
When one refers to Section 14.d.N.6.3.1.7 pp.7-8  
one reads, "Aircraft altitude flightpaths and  
scheduling will be strictly controlled  
to minimize disturbance to wildlife". And, additional  
reading of Section 14.3.N.6.3.6.6 p. 10 says:





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"Aircraft altitude, flight path and scheduling will be strictly controlled to avoid or reduce disturbance to birds, especially snow geese and raptors". There are no specified altitude routing or frequency limits provided:

The subject of aircraft overflight restrictions more recently has been discussed at this Inquiry especially on April 22, Volume 33, pp. 4472 to 4477 and 4500 to 4502 when Mr. Dau, for example p. 4502, line 16, saw no difficulty in general in following the recommendations of the consultants with respect to its altitude. The entire question, however, was qualified by Mr. Marshall on page 4477, line 19: "Incidentally, we are talking about recommendations, not regulations".

And that is the problem. There are no detailed environmental specifications to control the Project.

Similar examples could be documented for other topics. The lack of environmental specifications is particularly worrisome on the subject of fuel handling. Section 13.a.6.4.8 p. 38 states, "Where practical, fuel will be pumped directly from barge into storage tanks". This statement is repeated on p. 4331, line 19, of Volume 33 of the transcript. What sort of pipeline would be built from the wharf to the storage tanks? Since the tanks will be bladders -- that's bladder tanks -- will there be a control system to prevent



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1 overflowing? Will the areas be fenced or could  
2 bears get in and rip the bladders? There are  
3 many aspects of fuel unloading that are lacking  
4 the type of specification necessary to protect the  
5 environment.

6 On the subject of wharf  
7 construction in Section 13.a.6.4.4,  
8 p. 34, a total of five lines are devoted to it.

9 "It is expected that construction will utilize convention-  
10 al procedures." What conventional procedures mean  
11 in permafrost areas in terms of river bank development,  
12 grading, extent of the site and fuel handling  
13 are not treated.

14 The Board therefore considers  
15 that the applicant's exhibits should include detailed  
16 environmental specifications.

17 Where the plans for protecting  
18 the environment are offered by the applicant, those  
19 applying to on right-of-way activities are  
20 considered in much more detail than those applying  
21 to the off-right-of-way activities. Yet, off-right-  
22 of-way activities are likely to cause more environ-  
23 mental degradation than on right-of-way activities,  
24 and need to be just as well covered by specifications.  
25 Off right-of-way activities include development  
26 of borrow pits, quarries, access roads, staging  
27 areas for materials and wharves. They include  
28 such activities as the flying of aircraft at  
29 low altitudes, the cutting of timber, disturbing the  
30 vegetative cover by equipment and the improper



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1 use of snow and ice roads.

2 In addition to the lack of  
3 environmental specifications, we briefly mention  
4 several other type of inadequacies present in the  
5 application.

6 Several discrepancies appear  
7 which make impact assessment difficult. For  
8 example, the proposed pipeline Route Maps in  
9 13a 2.2 show "temporary access snow roads"  
10 from Milepost 0 to Milepost 770 in the  
11 map legend. Yet section 13 (a) 6.4.1 states that --  
12 states, "that in general, snow roads will be used in  
13 areas north of 65°latitude approximately Milepost  
14 440". The discrepancy of over  
15 300 miles between these two statements serve  
16 to point out how important it is to know exactly  
17 what is being proposed in order to properly determine  
18 impact.

19 On the subject of environmental  
20 protection measures, the applicant has  
21 proposed several techniques that have yet to be tried  
22 in permafrost regions. However, in the applicant's  
23 environmental statement, section 14.d.N it has been  
24 assumed that these techniques will be effective.  
25 And examples are:

- 26 1. Section 14.d.N.6.3.4.3. -- that's enough --  
27 "page 9. "Existing microdrainage  
28 systems will be maintained by allowing  
29 both surface and subsurface flows to pass over the  
30 ditchline and through the backfill, in addition





- 1 to providing protected mound breaks."
- 2 2. Section 14.d.N.6.3.4.6, p. 10 "The use of
- 3 ~~selected~~ materials, revegetation or erosion
- 4 control maps and drainage controls will
- 5 prevent surficial and gullying and minimize the
- 6 flow of sediments downslope into rivers and
- 7 streams."
- 8 3. Section 14.3.N.7.6, p. 12, "In those isolated
- 9 sections where some erosion and thermal subsidence
- 10 occurs , the applicant's measures will prevent
- 11 eroded soil material from spreading over large land
- 12 areas and/particular from reaching aquatic
- 13 habitats."
- 14 4. And from the same page: "Current designs, however,
- 15 provide for passage of surface water through
- 16 breaks in the pipeline crown and movement of
- 17 subsurface water through porous backfill where
- 18 necessary, thus eliminating the problem."
- 19 5. Section 14.d.N.7.8.1, p. 41, states: "The applicant
- 20 will maintain existing drainage patterns."

21 Now, many of these construction

22 activities will be conducted by sub-contractors,

23 many of whom will have licences to operate under

24 regulations drafted for less intense activities.

25 It will require an extra effort on the part of

26 the pipeline company to convey to all contractors,

27 sub-contractors and unions, that special environmental

28 regulations are in force in addition to regular

29 regulations. I think that Mr. Horte undertook

30 to accept this responsibility. I am pointing out



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1 that it is a very serious problem, how you do this.

2 In addition there must be  
3 an effort made in sufficient time that the subcontractors  
4 have a chance to plan their operations in the light  
5 of the special environmental regulations before  
6 they are given a contract to perform the work.

7 In other words, there is no use saying it  
8 after the contract has been awarded and the planning  
9 has been done by the contractor to say to them,  
10 "Oh, by the way, we have these additional regulations,"  
11 because he probably will not have the equipment  
12 or be able to do it in accordance with the regulations  
13 unless he knows before he gets the contract what  
14 is involved.

15 The applicant has presented  
16 a considerable amount of detail as to how it  
17 will manage its operations to insure the continued  
18 integrity of the pipeline. The same degree of  
19 detail is needed as how it will manage the  
20 operations under its control to insure the integrity  
21 of the environment.



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Review of the applicant's exhibits has led the Board to the opinion that specific environment protection commitments are lacking. The exhibits have been written in such general terms that specific environment protection procedures are not included. Although we have no reason to believe that the applicant will not provide a responsible environmental corporate structure to manage its own operations and those of its agents, this has not been demonstrated.

During the four years we have been working first with Alberta Gas Trunk Line, then Gas Arctic Systems Limited, and finally Canadian Arctic Gas Study Limited, we have been impressed with the sincerity of many of the people to keep the environmental change induced by the project to a reasonable level. Many of them are just as sincere about the environment as we are. I was encouraged to hear the applicant on May 24th, Volume 44, page 5734 to 36, undertake to exercise control of all operations contracted for by the pipeline company, and to take over the commitments made by the study company. These undertakings have reduced two of the concerns we expressed in Volume 1 of our impact assessment regarding the adequacy of the applicant's framework for achieving environment protection.

The applicant has been understandably reluctant in the exhibits to commit himself



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1  
2 to objectives or measures that he knows he cannot  
3 fulfill in all cases. As a result, many of his  
4 procedures for environmental protection are qualified  
5 and therefore not explicit. For instance, exhibits  
6 often read that such and such a measure "can be used"  
7 rather than "will be used", or if a measure "will be  
8 used," "will" is often qualified by the statement "in  
9 general," or "where necessary," We understand and sym-  
10 pathize with the applicant's dilemma regarding this  
11 matter. However, we believe that the environmental  
12 protection requires stipulations of explicit commit-  
13 ments.

14 Without the details of the  
15 proposed environment protection measures, one can  
16 only rely on the good intentions of the applicant,  
17 as well as the experience and the ability of the field  
18 inspectors of the government. Really, we find this  
19 unacceptable. In cases where an industry has  
20 well-established rules of practice to go by, this  
21 is often adequate; but rules of practice for pipelin-  
22 ing in the north with environmental concerns have not  
23 been established.

24 Let us now deal with the  
25 subject of environmental training. The applicant has  
26 made a definite commitment within its exhibits that it  
27 will provide an environmental training program for  
28 pipeline construction personnel from management  
29 through to the field worker. However, the level of  
30 training is not specified. The extent of the training





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1  
2 program for this job is the equivalent to a large  
3 school district. To actually set up and operate such  
4 a program needs personnel, time and money.

5 The applicant has made a  
6 commitment to train all project personnel; but the  
7 applicant's exhibits state that if approval is ob-  
8 tained in the first quarter of year 1, field activities  
9 will commence that summer. The summer of year 1 would  
10 thus see the commencement of surveying and clearing  
11 operations, the mobilization of groups involved in  
12 clearing wharf and stockpile sites, the confirmation  
13 of borrow pits, which is often done with bulldozers,  
14 and the deposition of fuel caches for the following  
15 winter's activities.

16 THE COMMISSIONER: Well, right  
17 now, according to Mr. Horte, the summer of year  
18 1 is the summer of 1976. That's --

19 A Yes, well I think that --

20 Q That's postulated on  
21 approval early in 1976 for <sup>the</sup> pipeline which may be  
22 an unrealistic expectation. However, that's --

23 A But that means to set  
24 up that school district, it should be in operation,  
25 the setting of it up and having the training manuals  
26 and the personnel to accomplish that, should be  
27 started very soon.

28 Q Well, you're saying  
29 if they really are serious about starting in the  
30 summer of '76, they should be seriously involved in



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1  
2 setting up these programs to train the personnel now?

3 A Yes, and obtaining  
4 people, and I recognize their problem because they  
5 don't know whether they're going to get a permit; but  
6 you know, I see the dilemma, but again our role is  
7 --

8 Q The chairman of the  
9 Energy Board has apparently said his hearings won't  
10 finish till sometime in 1976. They won't start till  
11 September or October of this year. Arctic Gas may  
12 have more time than they think.

13 A Well, regardless of what  
14 summer it's started, we would like to impress upon  
15 them the need for some lead time to have training  
16 manuals and training personnel.

17 In 1973 we transmitted to  
18 CAGSL a report which we commissioned entitled:

19 "Guidelines for Environmental Training of  
20 Construction Workers."

21 In this report it was pointed out that environmental  
22 training is not a panacea for environmental protection  
23 but a training program should be fully incorporated in  
24 the project organizational structure, that outside  
25 personnel participate, that training intensity be  
26 determined by the tpotential to do or make decisions  
27 that could result in damage, that the training schedule  
28 be determined by the project schedule and that the pro-  
29 gram adopted be exhibited to the government agency.  
30 In other words, there's no use, the applicant having



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one type of training program and training all the workers one way if the government agency, which is going to administer it, does not agree with it.

There has to be a liaison between the government people that are going to be supervising the government role, and the applicant's people.

Another inadequacy, in our opinion, in the application is the lack of detailed contingency plans. The applicant has not included contingency plans for meeting such emergencies as forest fires, spills of oil or other toxic materials, shortage of snow for winter road construction, and line breaks in the summertime in permafrost areas. These have been discussed but there is not a detailed plan. The Board believes that contingency plans for each of these eventualities should be included with the application.

Forest fires may be caused by many construction, operation, and maintenance activities, including logistic support activities, and to a lesser extent, by line breaks. Although fires can be advantageous to some components of the environment, this fact does not obviate the necessity for having a contingency plan to fight fires that do occur because of the operation. An important feature of such a plan would be the co-ordination of communication and the fire-fighting organizations of the Territorial Governments and the applicant.

If a rupture develops in the





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1  
2 pipeline, it will be necessary to transport personnel,  
3 pipe and large pieces of equipment to the trouble spot  
4 immediately. If the rupture happens in the summertime  
5 and in a permafrost region, terrain degradation and  
6 subsequent environmental effects can result from the  
7 transporting of the equipment, and I think that this  
8 was discussed by Mr. Hurd and his panel about two  
9 weeks ago, but it was only again talking about what  
10 could be done with low pressure terrain vehicles and  
11 others without, but not a detailed contingency plan.

12 A contingency plan describing  
13 the logistics of repair equipment access, the pro-  
14 cedures of repair, and the timing of equipment removal  
15 from the area is very important if detrimental effects  
16 are to be kept to a reasonable level. Some of the  
17 discussions during the construction and operations and  
18 maintenance panels indicate that a considerable amount  
19 of planning has in fact been done, but these are not  
20 available in a plan for evaluation.

21 In summary, then, we conclude  
22 that although the applicant has indicated a willingness  
23 to protect the environment, and I believe with sin-  
24 cerity, there has been in our opinion insufficient  
25 detailed commitment to demonstrate that an adequate  
26 environment protection measures will be observed.  
27 Detailed environmen\_tal specifications are lacking.  
28 Worker training programs are not detailed sufficiently  
29 to allow evaluation of whether they are adequate.  
30 Contingency plans are in some instances absent and in



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one case inadequate at this time.

I will now call on Dr. Adam  
who will present some of our concerns regarding the  
environmental implications of the engineering design  
of the proposed -- of the proposal before this  
Inquiry.



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WITNESS ADAM:

A Mr. Commissioner, for the next few minutes I will be speaking about the environmental implications of the engineering design. Since the hearings began we have reviewed a considerable amount of testimony on the subject of frost heave and drainage. Interruption of drainage as brought about by the ditch mound or by the frost wall, could result in downslope effects on vegetation and wetlands, and in slope instabilities. Frost heave can lead to overstressing of the pipe, thus causing rupture, leading to emergency repairs. Fire may also result from a pipeline rupture. As a result of the review, we have concluded that the proposed techniques for dealing with those problems are new and still untried for a chilled pipeline. We are recommending as a solution that the gas be transmitted at above freezing temperatures south of the Willowlake River.

Now, let me start at the beginning.

In the Environment Protection Board Interim Report No. 2, dated June 1972, we outlined some potential problems from an environmentalist's point of view that should be taken into account by the designer of the proposed gas pipeline. The potential problem areas outlined may be summarized as follows:

1. Permafrost degradation and the ensuing settlement
2. Frost heaving resulting from permafrost aggradation



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3. Drainage disruption resulting from the  
formation of permafrost beneath a cooled  
line, construction of berm or degradation of  
permafrost on the right-of-way
4. Slope stability, and
5. River crossings.

A program of office studies of the geotechnical and hydrological data pertinent to this project was carried out by Templeton Engineering Company of Winnipeg for the Board. The studies started on May 15, 1972, and resulted in a report as supporting data for our Interim Report No. 3 to Canadian Arctic Gas Study Limited and inserted as Appendix IV - "Geotechnical and Hydrological Studies: Off-Right-of-Way Effects" dated June 1973. That was submitted yesterday, June 2nd, as exhibit no. 137. The physical processes studied are permafrost degradation and thaw settlement, frost heave and frost heaving pressure, slope stability, seismology and soil erosion. The hydrological studies consisted of the development of a theoretical approach to describe the physical setting of the bodies of water affected by the pipeline since very little data were available.

Subsequent to these studies, work on the impact of the proposed gas pipeline was started with the interaction with other disciplines and the assessment is contained in the Research Reports in Volume 4 of our report on Environmental Impact Assessment of that portion -- excuse me,





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1 of the portion of the Mackenzie Gas Pipeline from  
2 Alaska to Alberta. -- And that is exhibit 135  
3 of yesterday's testimony.

4 Our impact assessment was  
5 based on the information and design techniques  
6 contained in the official application by Canadian  
7 Arctic Gas Pipeline Limited Volume 8, 13, and 14.  
8 However, 'during the course of this hearing  
9 additional information has become available either  
10 through the memorandum of CAGPL's response to  
11 PAAG or through questioning during this hearing. We  
12 believe that a re-appraisal of the environmental  
13 implications of the more detailed and/or new techniques  
14 is necessary. We have chosen to treat a  
15 couple of the problem areas such as drainage disruption  
16 and frost heave.

17 In the problem areas of  
18 drainage, the applicant has in section 8.b.1.3.8.4.1,  
19 pages 61 and 62, outlined various drainage control  
20 measures. For the pipeline right-of-way these measures  
21 are: (1) backfill mound breaks to permit surface drain-  
22 age to cross the pipe ditch, (2) diversion dikes to  
23 intercept and direct large runoff across the  
24 right-of-way. In ice-rich areas subject to settlement  
25 following thermal degradation, diversion dikes  
26 will be constructed of sand bags/ <sup>or</sup> of pit run granular  
27 soils placed either on top of the vegetative  
28 cover or in a shallow trench where subsurface flow  
29 must be intercepted, and (3) drainage ditches to  
30 be excavated as adjunct to diversion dikes in non-



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1 permafrost terrain and permafrost terrain  
2 that is thaw susceptible.

3 As you may have already noticed  
4 all those measures are designed for surface flow or  
5 subsurface flow in the active layer. That is, near  
6 surface flow. However, the applicant's  
7 environmental statement in section 14.d.N. dealt with  
8 subsurface drainage interruption, an  
9 aspect that has not been dealt with in the design  
10 of the drainage control measures in section 8.b.1.  
11 3.8. For example in section 14.d.N.7.3 (page 5),  
12 and I quote, "When pipeline operation begins,  
13 the gas will be chilled to a temperature below 32°  
14 F throughout most of the line north of 60° north.  
15 This will result in the development of a continuous  
16 frozen annulus of soil around the pipe, which  
17 may produce a localized barrier on sideslopes and in  
18 the bottom of very shallow rivers. Such barriers will  
19 not, however, substantially modify stream flow.

20 The frozen annulus in certain  
21 areas of the pipeline (generally north of Norman Wells)  
22 may also result in icings occurring on the pipeline  
23 right-of-way. It is not expected that these icings  
24 will give rise to problems."

25 This problem of frost bulb  
26 development on subsurface drainage at river  
27 crossings was mentioned in CAGPL memorandum on  
28 Response to Concerns of Pipeline Application Assessment  
29 Group (page 14, item d).

30 And in the response, or from the



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1  
2 response , I quote:

3 "It is agreed that operation of the chilled  
4 pipeline by itself could induce new icings at  
5 some minor river crossings. These , in themselves,  
6 are not viewed to be a serious problem either  
7 to the pipeline or to the environment. If the  
8 creation of such an icing will seriously  
9 deplete the winter water supply to a  
10 fish overwintering area, measures can be  
11 taken to insure that the groundwater  
12 continues to pass through the frost bulb  
13 around the pipe."

14 The technique in which the groundwater will be led  
15 through the frost bulb, however, is not described and  
16 from the response there is a lack of commitment about  
17 whether measures will indeed be taken, even assuming  
18 that the technique is adequate.

19 Explanation of the technique  
20 was given by Dr. Clark during cross-examination of the  
21 geotechnical panel at this Inquiry. For example,  
22 on page 2602 line 21 in answer to a question by Mr.  
23 Anthony, Dr. Clark said:

24 "The point is that if there is a significant,  
25 fairly good aquifer close to the surface and it was  
26 required to get water from one side to the other,  
27 we feel that with an insulated conduit it could  
28 be picked up on one side and redistributed on the  
29 other and carried through."

30 And on page 2732, line 15, in answer to question by Mr.





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1 Templeton, Dr. Clark said, :

2 "That is the point that I was getting at.  
3 There has to be a significant flow before  
4 this (that is, the insulated pipe), would  
5 be used."

6 And further, on page 3153 under questioning by

7 Mr. Scott:

8 "And would I be correct in saying to  
9 you that with respect to the subsurface drainage  
10 solution there is no precedent outside  
11 of the laboratories and the test sites  
12 for the usage of that device?"

13 Answer: Dr. Clark:

14 "I am not aware of whether that has  
15 been used for subsurface drainage."

16 Mr. Commissioner, since  
17 this technique is new and untried and since the  
18 disruption of drainage should the insulated pipe  
19 system fail to work, lead to increased instability  
20 and erosion, hence affecting water quality and its  
21 aquatic life, we are of the opinion that in the  
22 discontinuous permafrost zone, where the ice content  
23 is low, the operation of a pipeline at a temperature  
24 slightly above freezing will have less impact on  
25 the environment.  
26  
27  
28  
29  
30



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We feel that the problems of frost heave that we shall be treating next, reinforce our belief that a warm pipeline in the southern section of the route will create less impact on the environment.

Let me now turn to the subject of frost heave. Regarding frost heave problems, we shall endeavor to show how, out of the many measures proposed, to control or prevent frost heave, only a couple are actually being considered for wide use on the project.

Now, as I mention these I'm going to ask Mr. Hernandez to at least point to the point that I'm addressing.

In Section 8-B, 1.4.2, page 3, buried line stability, I quote:

"Where the geotechnical analyses predict a potential frost heave problem, several remedial measures can be taken.

1. The frost susceptible soils around the pipe can be replaced with non-frost susceptible material to a sufficient depth to prevent the formation of ice lenses.

2. A chemical grout can be injected into the soil to form a barrier to the migration of water to the freezing front in quantities necessary to form ice lenses.

3. The pipe can be insulated so that the formation of ice lenses is retarded,



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4. The pipe can be restrained with piles or anchors, as described previously, to prevent excessive differential movement.

5. Frost heave can also be counteracted by surcharging the pipe to the extent that heave forces are counter-balanced."

Now that's the list on the first column there.

Now we'll turn to page 6 of the canned evidence, and also Volume 19 of this Inquiry.

THE COMMISSIONER:

Excuse me, these are measures to avoid the frost heave occurring in the first instance?

A No, it was stated that these are remedial measures.

Q Well --

A I'm going to come, I think, to the next point.

Q -- but then if it does occur, they will put -- one of their proposals is to allow drainage to occur by putting a pipe through the frost bulb, a matter you just dealt with a minute ago, I think.

A Well, it's a matter of interpretation of "remedial measure". That's what it essentially means to me.

Q I see. Would you classify the measure you just dealt with, that is installing a pipe in the frost bulb to permit drainage, do you call that "remedial measure" in the same category as



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these?

A I would think that  
they're meant as methods to solve frost heave problems  
after this pipeline is in operation.

Q Yes, to prevent it  
occurring.

A No, we're coming to  
prevention, and I might as well point out now that  
you'll notice that they're the same. But I believe  
I point that out.

Q What's the same?

A Well, this is exactly  
the point I'm trying to make here, really, is that  
there are remedial measures and preventative measures  
that are exactly the same.

Q Yes, I thought these were  
preventative measures, and I thought the installation  
of the pipe through the frost bulb was a remedial  
measure; but I think I understand you fully. We seem  
to be having a misunderstanding about terminology,  
but go ahead, I shouldn't have asked any questions.

A Well, I think this  
next quote might help us. Turning then to page 6 of  
the canned evidence, and also Volume 19 of this Inquiry  
page-2188 and 89, we have these same techniques listed  
as preventative measures, and I quote from the canned  
evidence:

"In these areas, if the amount of differential  
heave is determined to be excessive, preventative  
measures will be designed into the system.





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1  
2 These measures consist of, surcharging the  
3 ground surface, replacing frost susceptible  
4 soil with non-frost susceptible soil, re-  
5 stricting water from migrating through the  
6 surrounding unfrozen soil towards the frost  
7 bulb around the cold pipeline, or reducing  
8 the heat flux away from the frost front so that  
9 the amount of water that can be frozen there is  
10 minimized."

11 Now I want to point out, that  
12 restricting the water from migrating is achieved by  
13 chemical grouting or similar means, and reducing the  
14 heat flux would be achieved by insulation or similar  
15 means.

16 Also on page 5 of the memoran-  
17 dum of CAGPL's response to PAAG, and I quote:

18 "We intend to take advantage of this fact  
19 by, "

20 now we're on column three there:

21 "burying the pipe deeper, and where necessary,  
22 by surcharging the ground surface to increase  
23 the load on the frost front to reduce the rate  
24 of heave. Other means of designing to con-  
25 trol frost heave problems consist of methods  
26 such as, replacing the frost-susceptible  
27 soil with non-frost susceptible soil, or  
28 reducing the heat flow out of the pipe by  
29 insulation. For special situations such as  
30 at river crossings, the concept of dual



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1  
2 pipelines might be used to advantage by  
3 alternating the flow. It is our position,  
4 therefore, that the frost heaving of the  
5 pipeline is amenable to rational analysis  
6 and that reasonable engineering designs  
7 for frost heaving are available."

8 I should point out here that  
9 alternating the gas flow at river crossings is a  
10 very local solution to frost heave.

11 Further, it appears that the  
12 remedial measures and the preventative measures are  
13 the same and have been used interchangeably.

14 THE COMMISSIONER: Q You say that your  
15 assessment of Arctic Gas' proposed measures lead you  
16 to the conclusion that it would be a mistake to chill  
17 the gas through from Willow Lake River south to 60,  
18 that instead you should run the gas through at temper-  
19 atures slightly above freezing?

20 A That's correct.

21 Q Don't -- let me just put  
22 this to you, though. Is your quarrel with -- you see,  
23 I follow you, you say that in their presentation, some-  
24 thing that may have eluded those of us who sat here  
25 through it, they brought forward measures that they  
26 described as preventive, and then they re-introduced  
27 them as remedial. That is, if the preventive measures  
28 don't work, and the thing happens that we were trying  
29 to prevent, then we will use the preventive measures  
30 all over again but we'll call them remedial. Now,



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1  
2 is that a dispute in substance, or is it just a matter  
3 of terminology?

4 A No, I think you just  
5 said it much better than I did.

6 Q Well, I can't argue with  
7 that.

8 (LAUGHTER)

9 A I might <sup>just</sup> as well ask you  
10 now, when I get through with this next section, would  
11 you do the same thing for me, please? I think it's  
12 even more confusing.

13 I now would like to turn to  
14 discuss the extent to which the applicant tends to make  
15 use of these five measures. Consider measure No. 1,  
16 with regards to replacement of frost-susceptible  
17 soil, page 2579, Volume 22, starting line 9, Dr.  
18 Slusarchuk said:

19 "This is not a proposed technique that we  
20 use generally in that <sup>particular</sup> situation; where we  
21 would be replacing frost-susceptible soil with  
22 non-frost susceptible soil would be in the  
23 areas -- in rather limited areas, I might add--  
24 say where the pipe comes out of the ground at  
25 around compressor stations and that perhaps  
26 at locations around river crossings and  
27 things like that, but not along the general  
28 overland problem of a freezing pipe going  
29 through unfrozen ground."

30 Consider measure 2 with





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1  
2 regards to chemical grouting, page 2580 in answer to  
3 a question by Mr. Anthony, Mr. Slusarchuk said,

4 "That was an idea we tossed around once upon  
5 a time, yes sir."

6 Question :

7 "Has it been abandoned?"

8 Answer:

9 "Not completely abandoned, sir. It's an  
10 entirely specialized technique that we have  
11 available in our arsenal of remedial measures,  
12 but it's certainly very low on our priority  
13 list."  
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On page 2582 on the same question of chemical grouting Dr. Hardy said, "...that is why I am still at the opinion that <sup>it</sup> is not a viable solution for the pipeline operation or the pipeline construction."

Consider measure three, with regards to insulated pipe, in answer to a question by Mr. Scott, on page 3224, volume 26:

"Q In what circumstances are you going to use the insulation of the pipe.

A (Dr. Slusarchuk): At river crossings, basically."

Later on the same page:

"Q. Is that only under the river? Or are you going to use it on the ground as well?

A. Basically under the river, sir."

So, to summarize, out of the five remedial measures we are left with only deeper burial or surcharging the pipe and restraining the pipeline by piles or anchors. However, the success of these measures rests on the basic principle of cut-off pressure. The cut-off pressure hypothesis appears to be inconsistent with observations by Dr. MacKay as was brought out at this hearing on page 3201 to 3205 volume 26. This leaves the matter of frost heave in some doubt.

THE COMMISSIONER: Excuse  
me, Dr. MacKay in Volume 26?

A Pardon me, sir?

Q Did you say Dr. MacKay's



1 testimony appeared in volume 26? -- You mean Dr. Ross  
2 MacKay, do you?

3 A Yes.

4 Oh, I see what the problem  
5 is -- I think I said it right, but it is just that it  
6 was discussed.

7 Q Oh, I see, yes, yes --

8 A Therefore, it is our  
9 position that environment protection cannot be  
10 guaranteed south of the Willowlake River with  
11 regards to frost heave problems due to a cold pipeline.  
12 Furthermore in these concerns it has been indicated that  
13 little economic advantage results from chilling gas.  
14 Page 2738, volume 23.

15 Since little economic  
16 advantage results from chilling the gas and serious  
17 environmental problems could arise as a result  
18 of chilling, then why chill?

19 Along the section of the  
20 pipeline from Willowlake River to the Alberta border,  
21 since problems of drainage disruption and frost heave  
22 will be prevalent, we believe that operating the  
23 gas pipeline at above freezing temperature will  
24 have considerably less impact on the environment,

25 Thank you.

26 THE COMMISSIONER: Thank you,  
27 Dr. Adam.

28 WITNESS TEMPLETON:

29 A Mr. Commissioner, if  
30 we are difficult with the applicant we don't reserve



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1 ourselves only to the applicant. We are equally  
2 difficult with government.

3 THE COMMISSIONER:

4 You should have been  
5 in Hay River.

6 A I would like to  
7 continue. The next section is not quite as long,  
8 if I could, and discuss the --

9 THE COMMISSIONER: Excuse me

10 Mr. Templeton--

11 MR. GOUDGE: Perhaps, Mr.  
12 Commissioner, we could break now and resume at  
13 nine in the morning if it is a satisfactory place  
14 for Mr. Templeton.

15 WITNESS TEMPLETON:

16 A Yes.

17 THE COMMISSIONER: All right,  
18 we will adjourn until 9 0'clock in the morning then.

19  
20 (PROCEEDINGS ADJOURNED UNTIL JUNE 4, 1975)  
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